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State Mineralogist

San Francisco

July, 1915

# Mines and Mineral Resources

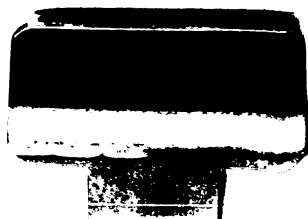
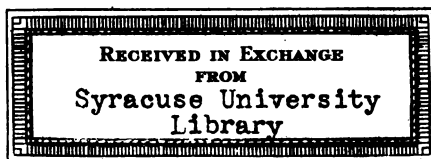
OF

Del Norte County  
Humboldt County  
Mendocino County

CHAPTERS OF STATE MINERALOGIST'S REPORT  
BIENNIAL PERIOD 1913-1914



CALIFORNIA  
STATE PRINTING OFFICE  
1915







CALIFORNIA STATE MINING BUREAU  
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# Mines and Mineral Resources

OF

## Del Norte County Humboldt County Mendocino County

COMPLIMENTS OF  
F. MCN. HAMILTON  
STATE MINERALOGIST

By F. L. LOWELL, Field Assistant



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## INTRODUCTION.

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The three counties presented herewith constitute the northernmost coast group, being at the northwest corner of the State and bordering on the Pacific Ocean. Until quite recently—in fact, subsequent to writing the body of this report—the only transportation connection Del Norte and Humboldt counties had with the rest of the world was by water, Eureka, Fort Bragg and Crescent City being the principal ports. The Northwestern Pacific Railroad has now been completed through to Eureka, giving all but the extreme northern section a direct rail route to San Francisco. A railroad connection to Crescent City is at present under construction from Grant's Pass, Oregon.

The principal industries of this district are lumbering, dairying and agriculture, the mineral output, except for Humboldt, being as yet small. The undeveloped mineral resources, however, are great, the exploitation of which is dependent mainly on improved transportation facilities.

Acknowledgment is here made of assistance rendered by the various owners of properties, both during the field work and in the subsequent preparation of this report.





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# DEL NORTE COUNTY.

Field Work in August, 1913.

## BRIEF GEOLOGIC DESCRIPTION OF DEL NORTE, HUMBOLDT AND MENDOCINO COUNTIES.

In discussing the geology of this section of the Coast Ranges, one is confronted with the similarity of the character of the rocks of the different geological ages and the scarcity of fossils by which the different series of stratified rocks may be distinguished. The rocks of the different formations have undergone such metamorphism that it is at times difficult to detect the change from one series to another. The Coast Range has been subject to so much disturbance that the rock masses have been crushed and faulted out of their original stratigraphic positions.

Beginning at the northern boundary of Sonoma County and extending north through Mendocino, Humboldt, and Del Norte counties, the geological structure is very regular. The rocks are mostly of Cretaceous age and are often very much altered. Serpentine, jaspers and mica slates are encountered in large quantities and in a very irregular manner. There are but few areas of unaltered strata.

The general strike of the axis of the Coast Ranges through these three counties is northwest and southeast and the preponderance of dip is toward the southwest, the crest of the range being nearer the eastern slope. The deep valleys have been eroded by the abundance of water and the level valleys of some of the watersheds contain strata of Pliocene age. These strata are shallow, and fossils have been noted in Del Norte and southern Humboldt counties. The Tertiary rocks are not as prevalent as those of the Cretaceous. The latter are to be noted more particularly in the oil field region of southwestern Humboldt County.

The South Fork of the Trinity River takes the same general northwest direction as the other rivers of the Coast Range. Trinity River changes its direction, flowing nearly west from Weaverville in Trinity County to where it joins the South Fork, thence northwest through the mountains to the coast. The Trinity Mountain range seems to be the joining strip uniting the main Sierras and the Coast Range. The rocks in this northern section become more crystalline, and the older granites which form the nucleus of the Sierras make their appearance. This granite outcrops north of Humboldt Bay and thence north to the state line.

From the junction of the Klamath and Trinity rivers, extending northward to the northern end of Del Norte County, the country is very rugged and covered with forests. The rocks resemble those of the Sierras and are auriferous and cupriferous. The gravels of the rivers

also carry gold and platinum values. In this northern region, serpentine is the principal rock. Peridotite, the parent rock of serpentine, is found exposed by erosion on Horse Mountain in northeastern Humboldt County.

It might be said that the greater part of the geological formations of Mendocino, Humboldt and Del Norte counties is composed of sedimentary rocks of Tertiary and Cretaceous age. There does not appear to be a nucleus of igneous rock forming the axis of the range, although granite does outcrop in some parts of this section. There are remains of volcanic activity in the form of volcanic glass and tuff, and solfataric action is still taking place at some of the springs of southern Mendocino County.

Throughout Mendocino and southern Humboldt counties the Cretaceous sandstones are abundant, being very noticeable at Point Arena and in the oil section of southwestern Humboldt. Organic remains are absent except in a very few instances. The rocks of this age have been altered to a considerable extent and serpentines and mica slates are the alteration products.

In Del Norte County, granite forms the nucleus of the mountain ranges and over it is a mantle of metamorphic rocks. In the western portion of the country sedimentary rocks prevail. Intrusive serpentine carries the copper and chrome iron deposits. Quartz occurs in small seams and veins. Copper occurs in lenses of a rich concentration, either as free metal or in sulphides. The slates carry many thin seams of quartz, sometimes rich in gold, and no doubt the erosion of these formations is responsible for the gold concentrated in the streams.

This serpentine belt continues through Humboldt and Mendocino counties. Perhaps the most noticeable occurrence is at Horse Mountain, in Humboldt County. There the copper deposits in serpentine are encountered again. The country has been eroded so extensively that the older crystalline diorites protrude through the more recent rock formations. Other acid rocks, such as quartzite, outcrop in large masses, besides a dike of porphyry which forms a well defined contact with serpentine. Not far from Horse Mountain on Willow Creek a large body of limestone is exposed, having a northwest strike. It resembles that in western Trinity County. Another limestone formation north of Humboldt Bay is well exposed. The granite formation also outcrops here.

Passing south through Humboldt County and across the redwood belt, the later formations of sandstone and shale come in. These carry the oil and gas of this section. The formation is very badly broken up and seepages of oil, and gas emanations are numerous. This formation continues into Mendocino County and is most noticeable on the coast at Point Arena. In the southern portion of Mendocino County, the

amount of alteration by the introduction of magnesian combinations is noticeable. This is illustrated by the magnesite deposits and the mineral springs of that section.

Taking the three counties together, one might say that the geology is complex, the solution of which will take considerable time and much patience to decipher.

### BLACK SANDS.

Almost all of the gold bearing gravels of the Smith River basin contain black sands which carry some platinum. The beach sands also carry values in gold and platinum. In cleaning up the sluice boxes of the hydraulic mines after the season's washing, these black sands are collected in large quantities and the platinum and gold content are found to vary greatly in their relative proportion to each other. On French Hill the platinum forms 5% of the total values. At Antone Kauss' mine on Craigh's Creek pieces of coarse platinum worth up to \$25 have been found. On the Myrtle Creek Mining Company's property the black sands are said to assay as high as \$3,562 per ton in gold and platinum.

Serpentine is a prominent rock formation in the Smith River basin, and being an alteration rock derived from peridotite which carries platinum, seems to bear out the theory of platinum deposits in the placer gravels.

Outside of these river gravels and sands the only other black sand deposit being worked in the county is on the beach 2 miles south of Crescent City.

*Oro Del Norte Company.* This company is incorporated for one million shares at a par value of \$1 per share. The company owns 255 acres



Oro Del Norte Black Sands Plant, showing method of hauling sands to bins on incline trestle.



Oro Del Norte Black Sands Plant, showing suction pipe line.



Oro Del Norte Black Sands Plant, showing the revolving screen.

of patented ranch land along the ocean beach 2 miles south of Crescent City. The plant is located just back of the driftwood line and consists of a suction pipe, skip conveyer to the plant, a large area of aluminum plates having riffles cut in them, a second area of small aluminum plates similar to the first, a third metal plate, the composition of which is not known, and an electrical equipment for charging the plates and other uses about the plant.

The company uses the Heintz electric flotation process for treating the sands for their gold and platinum content. The plant requires



Oro Del Norte Black Sands Plant, showing sand skip and track for dumping waste.

twenty-five men when in operation. Three shifts are worked and the electric power is developed by a 200 horsepower distillate engine. A change from the wood burning system to distillate was being made at the time I was at the plant. A larger suction pipe line was also being installed. The management claims that the new equipment will handle 800 yards of sand every twenty-four hours.

The suction pipe is 5 inches in diameter and works on the ejector principle. The sand is delivered from the pipe line to a revolving screen which screens out all driftwood and large wash which is trammed to the water's edge and dumped. The sand from the screen falls to a bin from which it is drawn off to a 2-cubic yard skip and hauled up the incline to the sand bins at the top of the treatment plant. Water is





Oro Del Norte Black Sands Plant at Crescent City, Del Norte County, California.

mixed with the sand in sufficient quantity to give it flowing properties. Four thousand gallons of water per minute is sufficient for all purposes about the plant, including the suction pipe line. The sand and water is allowed to flow over the metal riffle area at the same time an alternating current of electricity is passed through the metal plates. These plates have a grade of 2 inches to the foot and the magnetic iron which composes 30 to 50 per cent of the black sands is charged with electricity and repelled, leaving the gold and platinum in a concentrated condition. These plates are hosed off every half hour, the concentrates being washed into a sump from which they are pumped to a second set of aluminum plates of lesser area. These plates are charged with alter-



Oro Del Norte Black Sands Plant, showing the driftwood line.

nating current also but they are made more sensitive. The same process of elimination goes on here as before and these plates are washed off every hour and the concentrates, still further concentrated, go to a sump and are pumped over another metal plate, the composition of which could not be learned.

This plate is supposed to remove the gold and platinum from the remaining heavy minerals. The precious metals are refined and returned as pure gold, platinum, iridium, osmium, etc.

This plant has cost \$125,000, with the new equipment. Theodore R. Heintz, president and general manager; H. G. Stevenson, vice-president; and F. S. Markey, secretary. The main office is in the Merchants' Exchange Building, San Francisco.

#### BUILDING MATERIALS.

The local demand for building stone and brick is so small in the county that this industry has not been developed to any appreciable degree. A sandstone suitable for building purposes, and a clay suitable for making brick, are found 2 miles east of Crescent City. There is a good clay in Elk Valley, and Benjamin Howland is manufacturing

brick. He supplies the local demand at \$14 per thousand. There is also a deposit of good pottery clay in Elk Valley, owned by George Turner, but it is not developed.

### COAL.

Small seams of lignite are found in some parts of the county, but the one locality which has received most attention is on the beach, about 3 miles north of Crescent City. There is an outcrop of what appears to be a tree partly converted to lignite. This tree can be plainly seen at low water. No vein has been found. A shaft was sunk to a vertical depth of 138 feet at a distance of 200 feet inland from the beach line, but no coal or lignite was encountered. It is reported that borings a thousand feet from the shore penetrated a vein that was 3 feet thick. Very little information was available about this discovery, and no development has been done.

### CHROME IRON.

Chrome iron is fairly well represented in Del Norte County. There are several croppings in the Rattlesnake Mountains extending from the Bald Hills to the Klamath River. The deposits are in serpentine and are not being developed at this time. The two principal chrome-iron deposits worked so far in the county are owned by the Tyson Mining Company, of Baltimore, Md.

*French Hill Mines.* These mines consist of two patented claims situated on French Hill, in Secs. 5 and 6, T. 16 N., R. 2 E., H. M., at an elevation of 1750 feet. The chromite is in the form of kidneys in serpentine. The deposit strikes northwest-southeast, and dips 60° NE. It is 8 feet thick at the point where the development has been done. One hundred fifty tons of ore are on the dump, and about 200 tons were shipped to Swansea some years ago and proclaimed excellent.

There is a wagon road 3 miles in length from the county road to the property. The mine is owned by the Tyson Mining Company, of Baltimore, Md. It has not been worked for some years.

*Low Divide Mines.* These mines, consisting of three patented claims, are situated on Copper Creek, 1 mile from the old town of Alta, in Secs. 33, 34, and 35, T. 18 N., R. 1 E., and about 8 miles east of Smith River Corners, at an altitude of 1450 feet. The chromite is in serpentine. An open cut exposes the vein, which is 14 feet wide. There are about 500 tons of ore on the dump. This property is also owned by the Tyson Mining Company, of Baltimore, Md., but is not working now.

### COPPER.

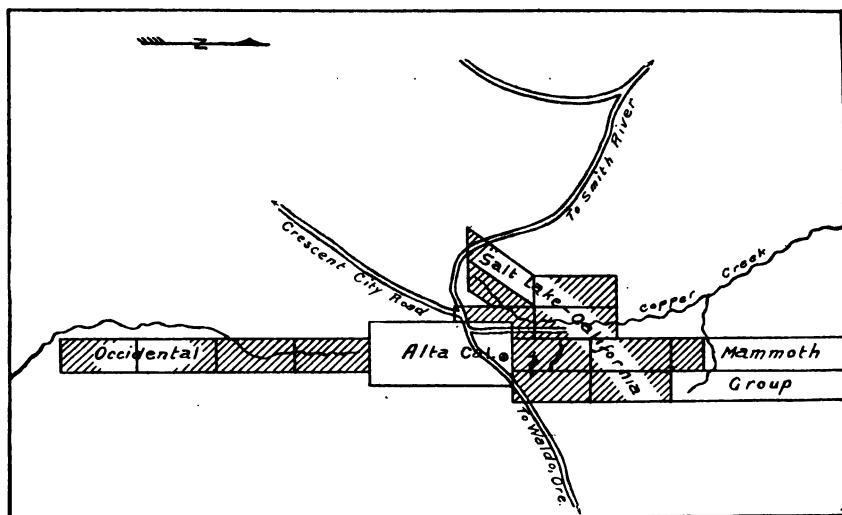
Del Norte County has several croppings of copper ore in its northern half, which extend easterly into Siskiyou County. The copper belt also extends southward along the eastern side of the county and on into Humboldt County.

As far as development in the past is concerned, the most prominent districts are Low Divide in the Smith River basin, and the Dr. Rock district in the southeastern portion of the county. Many scattering prospects are also noted in other parts of the copper belt, such as that on Diamond Creek, a tributary of Smith River; Monumental District, and also at French Hill.

The principal formation is serpentine, and the copper values are generally found in it or closely associated with it. Intrusive dikes of diorite and peridotite are common. The copper lenses appear to be more stable where the acid rocks break through and also show a tendency to persist in depth. The copper ore that has so far been worked, appears to be in lenses of varying sizes and rich in copper glance, cuprite, melaconite, malachite, and native copper. The primary ore, chalcopyrite, is not so much in evidence in the county. Between the years 1860 and 1870, copper ore was shipped from Del Norte to Swansea and also to Germany. The excessive cost of transportation and lack of roads throughout the county compelled the copper mines to close down until some future time, when a smelter will be within reach, or railroads are built into the country.

#### LOW DIVIDE MINING DISTRICT.

This district is in the Smith River basin and is the oldest copper camp in the county. It is situated at the head of Copper Creek, a tributary of Rowdy Creek, at an altitude of 1780 feet. Between the years 1860 and 1870 there was a prosperous mining town here with several hundred inhabitants. There are only two buildings standing at

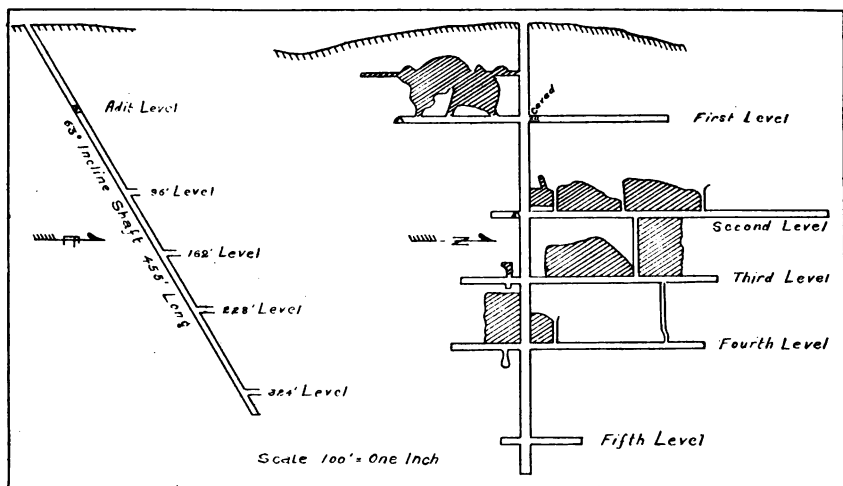


Low Divide Mining District, Del Norte County, California.

the present time, which are occupied by a caretaker of some of the properties. There is a wagon road from Smith River Corners, a distance of 9 miles, to the properties.

The formation is serpentine of a coarse texture and the strike of the vein on which most of the mines are located is north and south, having an easterly dip of from  $35^{\circ}$  to  $65^{\circ}$ . The vein swells and pinches along its length, forming lenses. The ores consist of chalcocite, bornite, chalcopyrite and some pyrrhotite.

*Alta California Mine.* This mine is owned by the Alta California Mining Company, with offices at 519 California street, San Francisco. The mine consists of two patented claims and these, taken with the Occi-



*Alta California Mine, Low Divide, Del Norte County, Cal.*

dental group of four claims which immediately join the Alta on the south, were bonded to the Salt Lake-California Copper Company, formerly known as the Union Copper Company.

Between the years 1860 and 1870 the mine was operated through an incline shaft 455 feet deep and inclined  $63^{\circ}$  E. This shaft was served by a steam hoist and an air compressor, but no equipment remains. Eight hundred ninety-five feet of drifting has been done on the four levels. The ore was shipped to Swansea and to Germany. These mines have been closed down for many years. The mouth of the shaft has caved. From old records it is shown that ores carrying values of 15% to 18% copper were taken out. Ore averaging 11% was being taken out when the mine closed down. Records of the shipments sent to Swansea show returns of \$41 to \$102 per ton.

*Salt Lake-California Mine.* This property was formerly known as the Union copper mine, and is owned by the Salt Lake-California Copper Company, of Salt Lake City, Utah. It joins the Alta on the north and

consists of ten claims. Three of these claims, the Union Nos. 1, 2 and 3, are on the extension of the Alta vein. Not far from the Alta north end line there is a strong outcrop of gossan carrying sulphides. This gossan extends the entire length of the two claims and fraction of 3600 feet. This has been exposed in several cuts, and oxides assaying 25% copper were found. There is a 60-foot tunnel and another tunnel 300 feet, both driven across the formation in an easterly direction. From the latter tunnel a drift 100 feet in length was run south and a raise made. A third tunnel further north is 450 feet in length and cuts the vein at that distance. There is a 100-foot drift south from this tunnel on the vein. A 60-foot winze was sunk from this drift. From the bottom of the winze a drift runs south 200 feet; and 17% copper ore was reported. This was the last work done before the mine closed down. A north drift runs from this same winze and is 240 feet in length. The 450-foot tunnel has been extended 200 feet to cut the east vein, but did not reach it. On Union No. 3 a vertical shaft 110 feet was sunk on the vein but no drifting was done.

There is an adit level on the Big Bonanza claim, running east on an east and west vein. This vein is 3 feet wide. This level was extended as far as 350 feet, with hopes of cutting the main north and south vein, but it was not found. Sixty feet below this adit level on the same claim, a 500-foot crosscut tunnel was run to intersect the north and south vein, but failed to locate it. Most of the old workings are badly caved. The shaft has caved near the surface. Four hundred tons of ore from the above 60-foot winze were said to have averaged 18% in copper and \$1.50 in gold per ton.

*Superior Copper Mine.* This mine was formerly known as the Atlantic Pacific copper mine, and covers the Mammoth group of fourteen claims which join the Union mine on the north. The character of the vein is the same as that of the Salt Lake-California mine.

There are three tunnels on this property: No. 1, a crosscut, cutting the west vein; No. 2 is 150 feet below No. 1, and is also a crosscut, 700 feet long. At a distance of 150 feet from the portal, a 4-foot vein of low-grade ore was cut which averaged about \$20 per ton in copper, gold and silver. This tunnel failed to cut the main vein. A distance of 250 feet above No. 1 tunnel, a third tunnel was run a distance of 500 feet, and cut a vein which was 2 feet wide. The vein pinched out, however, after some ore was shipped from it. The mine has been shut down for some years.

*Frank Zaar Copper Mine.* This consists of four claims held by location, the names being "Standard," formerly called Old Hanscom; "Nome," formerly the Copper Queen; "Discovery," formerly Lady Bell; and "A Beauty," formerly Copper Hill. The gossan is prominent on these claims, 4 feet wide with serpentine walls. There is a crosscut

tunnel on the Standard 500 feet long, which cuts a 4-foot vein carrying values in copper, gold and silver. From this tunnel there is a drift running southwest 50 feet and a drift northwest 50 feet long, also a winze 60 feet deep. Six hundred feet below No. 1 tunnel, a second crosscut tunnel was run 500 feet to cut the vein deeper but failed to do so. On the "Nome" there is a 28-foot vertical shaft on the vein and an open cut on an iron dike which is 18 feet wide. On "Discovery" a 50-foot vertical shaft was sunk. This is now caved. A crosscut tunnel 400-feet long failed to cut the vein. On "A Beauty" there is a 40-foot vertical shaft sunk on a 6-foot vein which assays 10% copper. Assessment work only is being done on these claims.

*Idora Mine.* This is only a prospect consisting of three claims situated 9 miles northwest from Low Divide, owned by William Ehrman, Yarbrough and Bricklin. Development consists of one crosscut tunnel 45 feet long, but has not reached the vein yet. There is a 30-foot incline shaft on the vein which is dipping  $45^{\circ}$  and is 3 feet wide. Five hundred feet along the vein has been stripped on the surface. Only assessment work has been done.

*Oriental Copper Claim.* There is only one claim held by location, and owned by E. R. Jenkins, of Crescent City. It is situated in the Low Divide mining district, at an elevation of 1900 feet. It has a 15-foot vertical shaft on a 4-foot vein. Only assessment work is being done.

#### DIAMOND CREEK DISTRICT.

*Cleopatra Copper Claims.* These claims are owned by James D. Lacey. There were formerly twenty-five claims held by location and known as the Dietrick group. Lacey lapsed in assessment work on all of the claims except one, which he retains. The claim is in T. 18 N., R. 2 E., H. M., at an altitude of 2600 feet, and is close to the California-Oregon line.

The claim was located in 1894, and is a contact vein with serpentine hanging and porphyry footwall. The strike is north and south and the dip  $45^{\circ}$  E. A 100-foot crosscut tunnel with a 40-foot north drift and a south drift of 80 feet. No. 2 crosscut tunnel is 180 feet long, and No. 3 crosscut tunnel is 130 feet long but did not cut the vein. About 200 tons of ore are on the dump but none has been shipped. Work ceased in 1911.

#### MONUMENTAL DISTRICT.

*Hunters Luck Claims.* There are six claims in this group, held by location since 1907. They are situated in T. 18 N., R. 3 E., at an altitude of 3100 feet, and owned by J. W. Ehrman and J. N. Britten. The vein is on the contact between serpentine hanging and porphyry footwall. There are two adit levels, the upper of which is 120 feet long.

The vein as exposed in this level is 8 feet thick. The lower level is 160 feet long and the vein as exposed is 1 foot wide. The strike of the vein is north and south and the dip  $50^{\circ}$  E. Ehrman lives on the property and is doing some development work. The ores are malachite, bornite and chalcopyrite.

*Britton No. 1 and No. 2.* There are six claims in this group, held by location since 1904, situated on Patrick Creek at an elevation of 1950 feet. The vein is quartz carrying copper and gold, and the walls are andesite. There are three crosscuts. The third is 340 feet long. There are 120 feet of drifts and a 60-foot winze. The strike of the vein is southwest and northeast and dips  $45^{\circ}$  SE. Only assessment work is being done.

*Klondike Group.* This group consists of Klondike Nos. 1 and 2, and seven others located on Patrick Creek, 1 mile south of Monumental. They were located by Luff & Duley, of Crescent City. The vein is quartz carrying marcasite and chalcopyrite, and is 4 feet wide. There are three tunnels. Only assessment work is being done.

*Lucky Boy and Rosebud.* Property is composed of two claims held by location, the Lucky Boy since 1901, and the Rosebud since 1902. They are situated in T. 18 N., R. 3 E., about  $\frac{1}{2}$  mile west of the county road, and are owned by Otto Anderson. The vein is quartz carrying marcasite and chalcopyrite. There are three veins on the Lucky Boy, all of which have cut the main vein, which is 4 feet wide in the upper workings. The strike of the vein is southwest and northeast, and its dip is southeast. There are two crosscut tunnels on the Rosebud, each 80 feet long. One cuts the vein 17 feet from the portal, and the vein was 17 feet wide. The vein is quartz carrying heavy iron sulphides, not much copper, and very little gold. Only assessment work is being done.

*Old Crow.* Consists of four claims, namely, the Bowman, Morgan Nos. 1 and 2, and the Jumper, all held by location since 1910, and situated in the Monumental district at an altitude of 2800 feet. They are owned by George F. Morgan and Fred Bauman. There is a 2-foot chalcopyrite-bearing quartz vein in porphyry. The strike of the vein is north and south, and the dip  $45^{\circ}$  E. There are two crosscut tunnels, neither one cutting the vein. Only assessment work is being done.

#### FRENCH HILL DISTRICT.

There are several copper prospects in this district that should be mentioned, namely—

*Hendrix and Howe*, consisting of five claims located in 1911, and owned by L. T. Hendrix and George W. Howe.

*Hendrix, Howe & McDonald*, consisting of five claims located on French Hill, located in 1911, and owned by L. T. Hendrix, George W. Howe and William McDonald.



*Frank B. Edwards*, prospect situated  $\frac{1}{2}$  mile east and 1 mile south of Mary Adams Station, in T. 17 N., R. 2 E. There is a tunnel 30 to 40 feet long. The ore is rich glance and carries values in gold and silver. Owned by Frank B. Edwards of Crescent City.

### OTHER DISTRICTS.

*Preston Peak Mine.* This group consists of two patented claims, namely, the "Hobs" and "Copper Belt," located in 1891; and three unpatented claims, namely, the "Mountain King" and two others, located in 1891. All are situated in T. 17 N., R. 5 E., at an elevation of 4400 feet. They are owned by Charles A. Leib, G. W. Young, H. Mathey and others, of 20 Broad street, Boston, Mass. The mine is in the Siskiyou Forest Reserve, and reached by 5 miles of wagon road and 15 miles of trail from Waldo, Oregon. It became involved in legal difficulties and closed down in 1901.

The country rock is diorite and serpentine, and the vein is quartz carrying chalcopyrite, pyrite, and values in gold. The ore is in the form of a series of lenses, having a strike of about southwest and northeast, and stands almost vertical in the serpentine. The surface croppings have been proven up for a distance of 200 feet. The mine is opened by a crosscut tunnel 315 feet, and at a distance of 235 feet from the portal a 48-foot winze in ore all the way. There was also 37 feet of drifting done around the ore body, and 400 feet of drifting on the tunnel level looking for more ore, but only small kidneys were found. At 650 feet below the upper tunnel a second tunnel was run 55 feet in length, but the work was stopped. No ore was ever shipped. The mine has not been working for some years and the camp buildings have fallen to decay.

*Doctor Rock Group.* This group of copper claims, six in all, are situated in T. 13 N., R. 3 E., H. M., at the head of Blue Creek, and have been held since 1903. The altitude is 4475 feet. The property is owned by Mrs. F. C. Marlowe, Cordelius Thompson, A. J. Monroe, and F. B. Faucett. The ore is quartz carrying chalcopyrite with slate footwall and serpentine hanging-wall. The strike is north and south and the dip uncertain. The croppings have been proven up for a distance of 800 feet. There is a 10-foot shaft on "Big Strike" claim and a 30-foot crosscut tunnel driven to cut this shaft failed of its purpose. There is a 37-foot adit level on the Doctor Rock claim. The ore carries values in gold and silver besides the copper. No ore was ever shipped and only assessment work is being done.

### GOLD—PLACER.

Almost all the gold produced in the county comes from the placer mines of Smith River and its tributaries. The mines are mostly small hydraulic properties where one or two small giants are used during

the winter months. In some instances a common fire hose and nozzle is used on the gravel banks and the water, collected from the gulches in the rainy season, is stored in small reservoirs and piped to the gravel.

*Aurora Hydraulic Mine.* This property consists of two claims of 40 acres, located on French Hill, in T. 16 N., R. 1 E., at an elevation of 1600 feet and held by location since 1907 by Frank Lind, the owner. The gravel consists of high benches and the water supply is dependent on flood waters from the gulches collected in a small reservoir. A 6-inch canvas hose and a 1½-inch nozzle is used to conduct the water and wash the gravel. The gold is coarse. The mine is operated only during the winter months when there is plenty of flood water.

*Doctor Young Hydraulic Mine.* Consists of four claims adjoining J. M. Darnell's mine in the French Hill mining district in Sec. 32, T. 17 N., R. 2 E., and owned by Dr. W. S. S. Young. There is 1 mile of ditch bringing water under a 50-foot head to one No. 1 giant through a 7-inch pipe. Assessment work only is being done.

*Dave Savoy Placer Mine.* Consists of two claims in the French Hill mining district. The gravel is ground sluiced, the water being collected in a small reservoir. Owned by Dave Savoy and worked during the winter months.

*Elkhorn Hydraulic Mine.* The property consists of 2560 acres, mostly bonded, located at the mouth of Patrick Creek, in Sec. 16, T. 17 N., R. 3 E., and controlled by the Smith River Mining Company of Tacoma, Wash. The property is held by location since 1903 and is at an elevation of 1050 feet. There are 3 miles of flume which brings water to three No. 2 giants. There are two camps with accommodations for 25 to 30 men. Three men are now putting the flume in condition to wash this winter.

*French Hill Placer Mine.* Situated in the French Hill mining district, in Secs. 32 and 33, T. 17 N., R. 2 E., at an elevation of 1800 feet. There are nineteen claims, covering 380 acres, held by location since 1898 and owned by J. M. Darnell. The property is a bench mine and has 5 miles of ditch carrying 500 inches of water from Craigh Creek, and has a 150-foot face. Two No. 2 giants are used, and about 5% of the values are in platinum.

*George Washington Placer Claims.* These claims are situated on Monkey Creek adjoining the Elkhorn hydraulic mine, and taken together with the Monkey Creek mine, make 480 acres of gravel which have been bonded to the "Winnie Bob" Mining Company, capitalized for 1,000,000 shares in the State of Washington. The property is to be equipped with a hydraulic plant soon, but only assessment work is now being done.

*George Cook Placer Mine.* This mine consists of five claims located 3 miles south of Gasquet on the middle fork of Smith River. It has 4 miles of ditch and one No. 3 giant. The water is brought from Humboldt Flat watershed. During the winter months 300 to 400 miner's inches are obtained. The claims are not patented. Considerable coarse gold and some platinum is obtained.

*Kaus Placer Mine.* Situated in Craigh Creek mining district in Sec. 1, T. 16 N., R. 1 E., and owned by Antone Kaus. Two claims have been held by location for the last forty years. The gravel benches are ground-sluiced, the water coming through a  $\frac{1}{4}$  mile ditch, giving a 30-foot fall. A 6-inch pipe and a 6-inch canvas hose bring the water to the gravel. A 2-inch nozzle is used. The gold and platinum are coarse, and worked during the winter months.

*Myrtle Creek Hydraulic Mine.* Situated in the Myrtle Creek mining district, in Secs. 3, 4 and 10, T. 16 N., R. 1 E., at an elevation of 260 feet, this mine is owned by the Myrtle Creek Placer Mining Company of Crescent City. The property consists of eighteen claims, or 360 acres. The gravel benches are washed by water taken from a  $1\frac{1}{2}$ -mile ditch, with a head of 75 feet. Eleven-inch pipe, with one No. 2 and one No. 3 giant, is used. The gold assays \$18.50 to \$19 per ounce. The black sands carry platinum in considerable quantity.

*Monkey Creek Placer Mine.* Situated in the Monkey Creek mining district and held by location since 1893, are seven claims owned by J. A. Haight and D. Haight. The gravel benches are ground-sluiced, the water coming through  $1\frac{1}{2}$  miles of ditch from Monkey Creek. The dam has collapsed and no work outside of assessment work is now being done.

*Nels Christensen Hydraulic Mine.* This property is situated 300 yards from the forks of Smith River and consists of 34 acres of bench gravel, held by location since 1885 and owned by Nels Christensen of South Fork. There is a  $1\frac{1}{2}$ -mile ditch carrying 500 inches of water with a 75-foot fall through 9 and 12-inch pipe to a No. 2 giant.

*Oak Flat and East Fork Groups.* This property consists of 270 acres located in the Patrick Creek mining district at an elevation of 1430 feet, and is owned by a party of eight people (S. F. Raymond, D. E. Raymond, A. E. Newman, A. E. Newman, Jr., C. Newman, J. W. Ehrman, and Homer White). The mine consists of 270 acres of bench and creek gravels. Water is brought from Shelly and Patrick creeks through 3 miles of flume and ditch with a head of 650 feet. One No. 2 giant is used. The ditch is built for  $1\frac{1}{4}$  miles and the remainder is now under construction.

*Walter Crook Hydraulic Mine.* This property adjoins Dave Savoy on French Hill in the French Hill mining district. It consists of

three claims owned by Walter Crook and held by location. There is 1 mile of ditch taking water from Allen Gulch, a tributary of Craigh Creek, through a 7-inch pipe to a No. 1 giant. Worked during the winter months only.

### GOLD—QUARTZ.

The output of gold from Del Norte County is due entirely to the placer mines, the production from the quartz mines being nil. Most of the ores from the quartz veins of the county are base and require concentration and shipment. The transportation facilities are so poor that development of quartz properties is hindered. Only assessment work is being done on such prospects at present.

*Black Diamond Gold Quartz Mine.* This mine is at an altitude of 6500 feet, and is nearly on the eastern boundary of the county, about 8 miles from the Doctor Rock mine. It consists of four claims located in T. 14 N., R. 4 E., H. M., and held by location by L. T. Hendrix. The vein, which is quartz, has a north and south strike and dips 70° E. Trap rock forms the hanging-wall, while the footwall is composed of shale. The ore is base and carries gold and silver values. The vein has been trenched, but no work further than assessment has been done.

*Hard Luck Mine.* This mine consists of six claims situated on Monkey Creek in the Monumental mining district and held by location since 1904 by J. N. Britton, of Waldo, Oregon. The vein is quartz carrying gold and arsenical sulphides. The development consists of two crosscut tunnels and 400 feet of drifts. Five tons of ore were shipped to the Selby smelter and are said to have assayed \$10.40 per ton in gold. Only assessment work is being done.

*Monumental Consolidated Quartz Mine.* This property consists of eight claims of 165.28 acres, located in T. 18 N., R. 3 E., in the Monumental mining district, held by location since 1901 by the J. O. B. Gunn estate and Davis. The mine is at an elevation of 2560 feet. The vein is quartz, carrying specular iron with gold values and some copper. There is a 3-compartment vertical shaft 212 feet deep and an incline shaft to the 100-foot level from the other shaft. There is  $\frac{3}{4}$  of a mile of drifts, an upraise from the 100-foot level to the surface and a winze from the 100-foot level. There are six prospect tunnels from 30 to 40 feet long. The ore is crushed in a Huntington mill and concentrated on a Frue vanner and Pender table, and the concentrates were formerly shipped to Selby. Power for the mill is furnished by water under 150-foot head through a 6-inch pipe acting on two Pelton wheels. The winding engine was run by steam and a Cameron shaft pump used to unwater the shaft. The camp consists of a store, bunkhouse, cookhouse, office, laboratory and barn, which are now in charge of a caretaker.

The mine has been closed down for several years and the camp is a convenient stopping place for travelers over the main highway from Oregon to Crescent City.

*Ora Anna Quartz Mine.* This property consists of one patented and three unpatented claims, owned by the Ora Anna Quartz Mining Company of Crescent City. It is situated in T. 16 N., R. 1 E., in the Bald Hills mining district, at an elevation of 1400 feet. There are two parallel veins between slate hanging-wall and hard porphyry footwall, and the vein filling is quartz carrying gold, both free and in the sulphides. The average width of the vein is 6 feet, and the strike is east



Monumental Mine buildings at Monumental, Del Norte County, California.

and west, with a dip of  $45^{\circ}$  to the north. There is a tunnel 300 feet long from which a winze 70 feet deep has been sunk. There is an upper tunnel 40 feet in length. The equipment amounts to very little and one cabin remains on the property. Since 1897 only assessment work has been done.

#### QUICKSILVER.

Quicksilver in small quantities has been found in the northern part of the county in T. 18 N., R. 2 E., H. M., and also on Diamond Creek, a tributary of Smith River. Poor transportation facilities prevent development.

## HUMBOLDT COUNTY.

Field Work in September, 1913.

## BLACK SANDS.

In former years the black sands of the beach and bluffs of northern Humboldt County were successfully worked at Upper and Lower Gold Bluffs, Big Lagoon, and Little River. The gold was fine and was saved by the use of the Oregon tom and ordinary tom and amalgamating plates. After a severe storm on the coast, the fine gold could plainly be seen concentrated on the beach in places. After the tide had receded, pack mules were taken down and the sand packed away in sacks for washing. Many thousands of dollars were taken out in this manner but for some reason the gold does not concentrate in paying quantities now and this method of collecting the sands has been abandoned. At Upper Gold Bluffs, a tunnel through the range of hills dividing Prairie Creek and the coast was cut one-half mile in length to bring water from Prairie Creek for washing the sands and gravels. The locators of these beach claims became involved in litigation with locators of the land as timber claims and mining has been abandoned and the plant is in ruins. The sands and gravels of Klamath River carry a good percentage of black sands having a gold and platinum content and some of the hydraulic mines are losing considerable of their values, which are carried away in the heavy gray and black sands which quickly clog the undercurrent riffles and cause an overflow of concentrates and values. They are desirous of finding a cheap method by which these sands can be worked continuously in connection with the ordinary hydraulic operations, thereby not only saving the values but also saving much lost time used up in clearing the riffles of the troublesome sands. Outside of the black sands encountered in the hydraulic diggings, there are no other sands that are being worked in the county at the present time. The gold and platinum are too fine and not in sufficient quantity to pay for working with the appliances available at present.

## BUILDING MATERIALS.

*Brick and Tile.* There are only two companies in Humboldt County who manufacture brick or tile and they are able to supply the local and county demand. The Fortuna brickyard at Fortuna formerly owned by J. A. Thompson has been closed down and Mr. Thompson is now interested in the Eureka Brick and Tile Company of Eureka.

*Eureka Brick and Tile Company.* John A. Thompson and John Porter own four acres of clay land in the suburbs of the city of Eureka. The plant consists of one stiff mud brick and tile machine, one mixing

machine, one grinding machine, one cut-off machine, one 70 horsepower engine, one boiler, one 300-barrel and one 100-barrel oil tank, water tank, scrapers and clay cars. Oil is used as fuel and the plant has a capacity of 25,000 brick per day. They make tile 3 to 12 inches in size and sell their brick at \$10 per thousand at the plant. Tiling is sold at 2 cents per foot for 3-inch size up to 15 cents per foot for 12-inch size. This tile is used principally in land drainage.

*Humboldt Clay Manufacturing Company.* Lewis H. Hess, president, and W. Ernest Dickson, secretary, of Eureka. They own  $1\frac{1}{2}$  acres of clay land adjoining the Eureka Brick and Tile Company in the suburbs of Eureka. The plant consists of one American Clay Machinery Company clay machine, one mixing machine, one disintegrator, one re-press, one cutoff machine, one 100 horsepower engine, two boilers, one oil tank (500 barrels). They sell the brick at \$10 per 1000 at the yard and have a capacity of 25,000 brick per day.

There is an excellent blue clay on Jacoby Creek owned by J. A. Moore which is well adapted for the manufacture of brick. Nothing is being done with the clay at the present time.

### QUARRIES.

The only quarries in the county are those being operated for the purpose of obtaining rock to be used in building the jetty at the mouth of Humboldt harbor and for road metal.

*Haw Quarry.* This quarry is owned by G. A. Dungan and I. M. Long, and is situated in Sec. 21, T. 5 N., R. 1 E., Humboldt meridian, and 6 miles from Eureka, at an elevation of 150 feet. There are 700 acres. The rock is a basaltic lava termed tachylite (Lawson). The plant consists of one mile of standard gauge railroad which connects with Humboldt Bay. There is one locomotive and eleven bottom dump cars, one barge, one tow boat, one air compressor, two Sullivan air drills, one No. 3 gyratory crusher, one 12-foot screen, drill tools, etc. The buildings consist of a cookhouse, blacksmith shop, powder house and several smaller buildings. Electricity is purchased at 2 cents per kilowatt hour. The capacity is 400 tons per ten hours. The rock is hauled by rail one mile to the bay and loaded on barges and towed to Eureka. The specific gravity of the rock is 3.169 and contains 42.7 per cent silica. The rock is used for road metal and for filling.

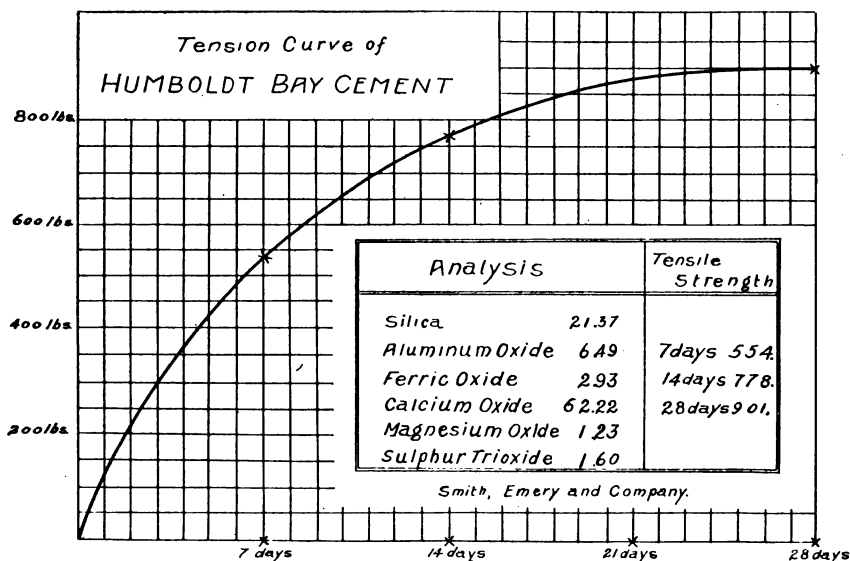
*Jacoby Creek Quarry.* This quarry is leased by the Pacific Engineering and Construction Company of San Francisco, S. L. G. Knox, president. The quarry is 5 miles from Arcata and the equipment consists of 5 derricks, 90 cars, 3 barges and 1 tug, one 4-drill compressor, 4 compressed air drills, 1 drill sharpener, 2 hoisting cranes and the necessary drill steel. This company has the contract for furnishing the fill for the harbor jetty now being built. The rock is a meta-morphic sandstone

and one quarry is a mica schist. This company is supplying the rock for the construction of the jetty at the entrance of Humboldt harbor.

*Isaac Minor Quarry.* This quarry consists of granite suitable for building purposes and is situated on Warren Creek which is a tributary of Mad River in T. 6 N., R. 1 E. Although the rock is suitable for building purposes, yet granite used in the county for such purposes as monuments is imported from other parts of California. There is so little construction going on in the county that requires a good building stone that the quarries, or rather the prospective quarries, have not been developed. The only rock being used at present is that used for road metal and for the federal work on the harbor jetty.

### CEMENT.

A cement manufactured from a limestone cropping on Jacoby Creek in Secs. 13 and 14, T. 5 N., R. 1 E., on the property of the Bayside Lumber Company has been tested and an analysis made by Smith-Emery & Company of San Francisco, and the following facts as shown by this tension curve, obtained:



### LIMESTONE.

There is considerable limestone in the county suitable for burning for lime and also for fertilizer and smelter flux. The most accessible deposits to Humboldt Bay are on Jacoby Creek in Secs. 13 and 14, T. 5 N., R. 1 E., on the property of the Bayside Lumber Company. It is 3 miles from the bay and on the railroad. There is also another



deposit on Jacoby Creek owned by J. A. Moore of Blue Lakes, Humboldt County. The analysis by the Miller & Brown Company of San Francisco gives the following results:

**Analysis of Limestone from Jacoby Creek.**

Received from State Mining Bureau, 1 piece of rock for analysis.  
Sample found to contain the following:

Silica, $\text{SiO}_2$ -----	1.41%
Lime, $\text{CaO}$ 53.61%, $\text{CaO} \cdot \text{CO}_2$ -----	95.74
Iron oxide— $\text{Fe}_2\text{O}_3$ -----	.35
Alumina— $\text{Al}_2\text{O}_3$ -----	.56
Magnesia— $\text{MgO}$ -----	Trace
Water-----	.01
Residue from carbonaceous matter-----	.50
	<hr/> 98.57

Volatile,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ , etc. = 42.40 per cent.

There is a large dike of limestone crossing in a northwesterly direction from Trinity County to Humboldt County in T. 4 N., R. 5 E., which extends northwesterly and passes to the east of Horse Mountain and cuts across Willow Creek. This limestone formation has not been developed and is a source of immense quantities of good limestone.

There is also considerable limestone in the southeastern section of the county which has not been developed.

**COPPER.**

The copper belt of Humboldt County, as far as development to date has proved, extends along the eastern part of the county, east of the redwood belt and extending from the southern end of Del Norte County south for the entire length of Humboldt County and over into the



Copper Croppings on the property of the Horse Mountain Copper Mine, Humboldt County, California.

parts of western Trinity County difficult of access. The copper of Humboldt County, like that of Del Norte County, is associated with serpentine. There are dikes of quartzite and diorite protruding through the serpentine in many instances and also the mother rock of serpentine, called peridotite, is encountered in a more or less altered condition.

The principal district where copper mining is being done at the present time is Horse Mountain, situated in T. 5 and 6 N., R. 4 E. The ore on the mountain seems to be of a secondary nature, consisting



Camp buildings of the Horse Mountain Copper Mining Company, on Horse Mountain, Humboldt County, California.

of bunches of impregnated serpentine close to the surface, in which the values run high in copper glance, bornite, native copper, and malachite. The general strike of the formation is northwest and southeast, with a dip to the northeast. The formation is mostly serpentine, porphyry and gabbro, the latter having peridotite closely associated with it, from the decomposition of which the serpentine is formed. Chrome iron is also encountered in small quantities in the serpentine.

There are quartz and diorite dikes protruding through these formations all seeming to have a northwest and southeasterly direction and a northeast dip.

Next to Horse Mountain, the district where copper development has been done to a considerable extent is Red Cap Creek. Several Copper

companies, namely the "Red Cap," "La Perin" have held claims on the ridge between Boise and Red Cap creeks and have done considerable work. Much rich copper ore has been found in the slides from the hills but the ore has never been found in place. No development is being done at the present time and the old tunnels have caved in and the buildings gone to ruin.

Nothing in the way of development is being done on Lassen Creek in T. 1 S., R. 4 E., or on the Rainbow or Crimson groups, in T. 1 S., R. 1 E., in the Mattole mining district.

#### Horse Mountain District.

*Horse Mountain Copper Mine.* This property consists of ten groups of claims, making 70 claims in all. They are unpatented and are situated on Horse Mountain in Secs. 33 and 34, T. 6 N., R. 4 E., and Secs. 3 and 4, T. 5 N., R. 4 E., at an altitude of 5000 feet. The property is owned by the Horse Mountain Copper Company, which is a



Mill of the Horse Mountain Copper Mine, Humboldt County, California.

stock company. The railroad from Eureka runs to within 25 miles of the mine and this distance is covered by a good wagon road. The original claims were located by Dave Wilson in 1907. The strike of the formation is northwest and southeast and dips about  $40^{\circ}$  NE. There are six crosscut tunnels and one adit level, also some open cuts. There is 3000 feet of underground development, mostly drifts and crosscuts. Steam supplies the power for the sawmill and two Huntington mills (one being  $3\frac{1}{2}$  and the other 5 feet). It also furnishes power for a Blake ore crusher, two Dodge secondary crushers, one Standard and one United concentrating table and two classifiers. Twenty-six men are employed underground and on the surface. Some concentrates have been shipped to Humboldt Bay but have not reached the smelter.

The middlings are stored for future treatment. The concentrates average 20% copper and the middlings about  $\frac{2}{3}\%$  copper. The values in gold are about \$4 per ton for the concentrates. A 16 h.p. Corliss distillate engine furnishes power for ventilating. Two 50 h.p. boilers, one 14 h.p. engine, one 20 h.p. engine and one 40 h.p. engine complete the power equipment.

The surface equipment consists of one sawmill with a capacity of 7000 feet, one blacksmith shop, one timber framing shop, barn, cook-house, office, assay office, powder magazines and several bunk houses, making 35 buildings in all. Scraps from sawmill used for fuel.

*Humboldt Copper Mine.* This mine consists of eight claims or 160 acres, unpatented ground, which adjoins the Horse Mountain Copper mine on the southwest and lies in Secs. 28 and 29, T. 6 N., R. 4 E., and Secs. 32 and 33, T. 6 N., R. 4 E., at an altitude of 4800 feet. A wagon road is 25 miles from Korvel to the mine. The mine is owned by the Humboldt Copper Mining Company of Eureka, T. L. Loofbourrow, president, and Kenneth Newett, Jr., secretary. The original claims were located in 1905. The country rock is mostly serpentine with dikes of porphyritic diorite and granodiorite. The ores consist of chalcopyrite, chalcocite, cuprite, and free copper. The strike is northwest and southeast and the dip  $45^{\circ}$  to the northeast. The underground workings consist of three crosscut tunnels, 25, 100 and 700 feet, respectively. There are 750 feet of drifts, 20 feet of winze and 210 feet of raise. Assessment work only is being done and no ore has been shipped. The surface buildings consist of a cook house, bunk house and blacksmith shop.

*Sweet Home Copper Mine.* This property consists of eight claims of 160 acres of unpatented land adjoining the Horse Mountain mine and lies in Sec. 28, T. 6 N., R. 4 E., at an altitude of 4800 feet. The property is owned by the Sweet Home Mining Company of Eureka, E. P. Shier, president. A wagon road crosses the property and is within 1000 feet of the main workings. The ores are the same as those



Horse Mountain Copper Mining District, Humboldt County, California.

of the Horse Mountain mine. The strike is east and west and the dip  $45^{\circ}$  N. There are four crosscut tunnels and 230 feet of drifts. The company is doing assessment work only and some ore has been shipped for a test. The ores are chalcocite, bornite, cuprite and native copper. The surface equipment consists of a bunk house, cook house and a blacksmith shop.

**Ruby Copper Mine.** This property consists of thirty-eight claims or 760 acres of unpatented land situated to the northwest of the Horse Mountain Copper mine in Secs. 16, 21 and 28, T. 6 N., R. 4 E., at an altitude of 4500 feet. These claims are owned by the Ruby Copper Mining Company of Eureka, E. A. Walters, president, and Frank W.

Belcher, secretary. There is a wagon road to the mine. The original claims were located in 1907 and consist of the Blind Lead Group and the Ruby Group. Serpentine with dikes of porphyritic diorite and quartzite makes up the formation and the ores are the same as those of the Horse Mountain mine. The strike is northwest and southeast with a vertical dip. The underground workings consist of a crosscut tunnel 510 feet long and 250 feet of drifting. A small 60-foot shaft from the surface is also sunk.

The surface buildings consist of a cook house, bunk house, blacksmith shop, and a timber shed. The mine is in a developing stage and the ores consist of chalcopyrite, cuprite, chalcocite, and bornite. There are also some black oxide ores and some gold values are obtained.

#### Mattole Mining District.

*Rainbow Group.* This copper prospect, consisting of nineteen claims, is located sixty miles south of Eureka in Secs. 19, 30 and 32, T. 1 S., R. 1 E., and also in Secs. 12 and 19, T. 1 S., R. 1 W. Several trenches have been cut across the vein matter and some carbonate ore has been opened up for several hundred feet along the strike of the croppings. No work has been done on this group of claims for some time.

*Crimson Group.* This group of copper claims, consisting of 80 acres of patented land, joins the Rainbow group of mines on the south, and is in Sec. 8, T. 2 S., R. 1 E. Several prospect holes have been sunk over the 80 acres and carbonate ore has been found. No work has been done on the property for some years.

#### COAL.

There are indications of lignite seams in several parts of the county, including the following places:

Maple Creek.

East branch of north fork of Eel River.

Near Mrs. Ray's house at Garberville.

Mad River.

Van Dusen River, two miles east of Hydesville.

Crogan Gulch, Maple Creek.

Buck Mountain Creek, near Garberville.

Coal is also found at the following places in the county:

On the east branch of the north fork of Eel River..

Ten miles from Garberville.

Jacoby Creek.

Two miles north of Arcata.

On the upper Mattole River.

On Larribee Creek.

Some of this coal has been burned in a blacksmith forge and found to be satisfactory. The seams, however, are not wide and this taken together with the cost of transportation and the cheapness of oil fuel, prohibits the development of these coal and lignite seams.

### GOLD.

The gold production of Humboldt County is not large, being only \$31,271 for the year 1912 (California State Mining Bureau Bulletin 65). This gold comes from the placer mines in the northeastern part of the county, on the Klamath River from the Hoopa Indian Reservation to the eastern county line and from the south end of the reservation southward along the Trinity River to the east line of the county. There are also two quartz mines that are being developed, but without any production as yet. One is on Red Cap Creek, which is a tributary of Klamath River, and the other is at the headwaters of Willow Creek, which is a tributary of Trinity River.

*Red Cap Mine* (quartz). Consists of ten quartz and three placer claims, all unpatented and owned by a stock company called the Red Cap Mining Company of Eureka, Humboldt County. The claims are located in Sec. 33, T. 10 N., R. 6 E., on the north fork of Red Cap Creek at an elevation of 2640 feet above sea level. These claims have been held since 1899. The country rock is porphyry with diorite dikes intersecting the formation. There are four veins being worked at the present time. The ore in the upper levels is free milling and in the lower levels it is a heavy sulphide carrying some copper. The strike is northeast and southwest and dips 70° to the northwest. There are three tunnels and 280 feet of drifts; also a 4-foot crosscut tunnel which is the lowest working tunnel and is only 45 feet in length. There are 100 feet of raises and 30 feet of winze. The mine equipment consists of the usual strap iron tunnel track, one ore car, blacksmith shop, hand steel, etc. The reduction equipment consists of a Gardner crusher, one Frue vanner concentrator, and amalgamating plates. There is also a wire aerial tramway from the upper tunnels to the ore bin at the crusher. The mine is only developing and no ore is being shipped.

*Bonneyville Quartz Mine.* Consists of six claims and a fraction of 130 acres of unpatented land owned by the Bonneyville Mining Company of Eureka, F. E. Peaslack, secretary, and Charles Helwig, president. The claims are located in Sec. 15, T. 6 N., R. 4 E., at the head of Willow Creek, which is a tributary of Trinity River, and at an elevation of 1640 feet. The claims have been held since 1912. The country rock is slate and porphyry. The veins are all in slate with the exception of one which is a contact vein, the contact being slate and porphyry. The strike of the formation is northwest and southeast and dips northeast about 30°. There are four adit levels with 15, 15, 20 and

375 feet of drifting done on them respectively. There are two cross-cuts, one 15 feet and one 35 feet, 375 feet of track of strap iron, one ore car and the necessary drill steel. There are two cabins on the property and a road was being built from the county road to the property. A water right of 300 inches also belongs to the property.

*Little Klondike Mine.* Consists of three placer claims and four quartz claims owned by F. Lubbs of Orleans, which adjoin the Red Cap mine at the head of Red Cap Creek. The quartz vein has porphyry walls and is very irregular in width. It frequently carries high values in free gold and in other places traces of copper are found. There is one mile of ditch and a cabin on the place. Only assessment work is being done.

*Quartz Prospect on Peach Creek.* This prospect is on Peach Creek, 2 miles from its mouth and 3 miles from Orleans. It consists of one claim on a vein which is 6 to 14 inches in width in schist formation. It carries free milling quartz which is crushed with an arrastra which is run by water power. The vein is inclined to be pockety and the gold is rather light, going \$14 to the ounce. This prospect works in winter only.

#### GOLD—PLACER.

Placer mining in the county is confined to the Klamath and Trinity rivers, and the season varies from a few days (as in the case of the high gravel banks) to several months during the winter for the lower bars, where water can be ditched to the property.

*Allen Mine* (hydraulic). Consists of two unpatented claims owned by A. H. Allen of Orleans and located in Sec. 15, T. 10 N., R. 5 E., at the mouth of Red Cap Creek at an elevation of 460 feet. These claims have been held since 1898. They consist of bench gravels on a slate bedrock. There are 3.4 miles of ditch, 1000 feet of 11-inch pipe and one No. 2 giant served by 400 inches of water under a head of 80 feet. The gold is saved by block riffles, undercurrent and quicksilver. The mine works five months during the winter. The gold mints \$17 per ounce and has platinum associated with it in small amounts.

*Bondo Mine* (hydraulic). Consists of two claims of 40 acres, formerly known as Croton Bar Mine and Markeson Mine, and owned by Morris Bondo of San Diego. The property is located in Sec. 29, T. 11 N., R. 6 E., on the Klamath River,  $1\frac{1}{2}$  miles up the river from Orleans. They consist of bench gravels, some of the gravel being cemented. The bedrock is rough slate, the strata standing on end. There are one mile of ditch and flume, 1400 feet of 22-inch, 18-inch, 15-inch and 11-inch pipe, two reservoirs and two No. 2 giants. There are 800 feet of sluice and the gold is saved by block riffles and quicksilver.



There are a house, blacksmith shop, barn, powder house and a derrick on the property. The gold mints \$17.10 per ounce and the gold is about the size of wheat.

*Cavanaugh Mine* (hydraulic). Consists of one claim of 20 acres owned by C. A. Sample of 1202 I street, Fresno. It is located in Sec. 1, T. 9 N., R. 4 E., on the Klamath River, about 3 miles above Weitchpec, at an elevation of 550 feet. This claim was located in 1870 and has changed hands several times. The bedrock is an altered schist and the course of the channel is east and west. The property has 900 feet of ditch and brings 300 inches of water from Boulder Creek at a head of 90 feet. One No. 1 giant with 11-inch pipe is used. Block riffles with quicksilver and no undercurrent. The gold assays \$18 per ounce. There are two houses, one blacksmith shop and a barn on the property. Work is done only during the winter months.

*Clover Flat Placer Mine.* Consists of 170 acres of patented mineral land and 173 acres of unpatented land owned by the Clover Flat Gold Mining Company of which F. E. Herrick is president and L. B. Camp-ton is secretary. The mine is located in Secs. 17 and 20, T. 7 N., R. 5 E., on the Trinity River about one mile north of the village of Willow Creek (sometimes called China Flat) at an elevation of 675 feet. The claims were located in 1870 and worked most of the time up to 1912. The bedrock is slate and the course of the channel is north and south. The property has  $2\frac{1}{2}$  miles of ditch which brings 2500 inches of water under a 175-foot pressure. The gravel is heavy wash. Block riffles, undercurrent and quicksilver are used for saving the gold. The equipment consists of 1000 feet of 22, 18, 15, 13 and 11-inch pipe, one No. 2 and one No. 3 giant, 400 feet of sluice, one reservoir covering an acre of ground and another reservoir a little less than an acre in area. A derrick is used for moving large boulders. The gold assays \$18 per ounce. The gravels contain a large percentage of heavy black and gray sands, which cause considerable trouble in the riffles and under-current by clogging up and causing the gold to flow over. There is one third as much platinum as gold content. The mine has shut down until such time as some appliances are found for saving the gold and platinum contained in the heavy sands.

*Florence Placer Mine.* Consists of one claim of 20 acres of unpatented mineral land owned by J. E. Middlesworth and located in Sec. 31, T. 10 N., R. 5 E., on the Klamath River a little over 3 miles above Weitchpec, at an elevation of 570 feet. This claim was located in 1907 by J. E. Middlesworth, and has been worked ever since during the winter months. There is a good road to a point on the river opposite the mine. The bedrock is an altered schist. The gravel is a medium wash and the course of the channel is northeast and southwest. There

are 340 feet of ditch which carries 300 inches of water at a 40-foot pressure. Split riffles are used in saving the gold. A 7-inch pipe and canvas hose are used for conveying the water to a 2½-inch brass nozzle. The gold is scaly. It assays \$18 per ounce. There is one cabin on the property and a pipe shed.

*Klamath River Hydraulic Mine.* Consists of fourteen claims or 280 acres of unpatented mineral land formerly known as the A. D. Miller mine and owned by the Klamath River Mining Company. The mine is located in Sec. 1, T. 9 N., R. 4 E., and Sec. 6, T. 9 N., R. 5 E., in the Weitchpec mining district and about 3 miles north of the village of Weitchpec, on the Klamath River. The elevation is 550 feet. These claims have been held since 1860. Good roads to the mine from the coast, also from Orleans. There are two miles of flume which brings 1500 inches of water under a pressure of 200 feet. The gravel benches have a northeast and southwest direction and the bedrock is an altered schist. The gravel is a medium wash and carries no cement gravel. The claims were located in 1860. An 18-inch pipe serves a No. 4 giant and 16-inch pipe for a No. 3 giant. The present company has been operating for the past three years. The gold assays \$18 per ounce.

*Orcutt Hydraulic Mine.* Consists of one claim called the Indian Jack and owned by Ira Orcutt and located in Sec. 29, T. 11 N., R. 6 E., in the Orleans mining district about 2 miles northeast of the town of Orleans. The claim is unpatented and lies at an altitude of 500 feet. These claims were located in 1891 by Orcutt and have been worked every winter since. The bench gravels have a northeast and southwest direction and the bedrock is slate. There is a ditch 3 miles long that brings 500 inches of water under 150 feet pressure; 500 feet of 11 and 9 inch pipe conducts the water to one No. 2 giant.

*Orleans Bar (hydraulic).* Consists of 1300 acres of patented mineral land and about 600 acres of unpatented land owned by the California Mining and Dredging Syndicate and located in Sec. 1, T. 10 N., R. 5 E., Secs. 25 and 36, T. 11 N., R. 5 E., Secs. 30 and 31, T. 11 N., R. 6 E., on the Klamath River at the town of Orleans at an altitude of 376 to 3300 feet above sea level. The years of location of the different claims are not given. The gravels are bench gravels, some being high benches and other low benches. There is a good road to the property, completed during the summer of 1912. The claims are on the Klamath Forest Reserve, and the tailings are dumped into the river. There is a report on the property made by H. DeC. Richards, E.M. Water is brought from Camp Creek, Wilder Creek and other creeks and there are 10 miles of flumes and ditches which carry 2000 inches of water that can be delivered under a head of 400 feet. The course of the channel is northeast and southwest and the bedrock is slate and serpentine.

The slate is stratified with quartz seams. The mine is equipped with reservoirs and also has 3000 feet of 18-inch and 11-inch pipe and four giants, namely, one No. 3, two No. 4 and one No. 5. There are two sawmills, four blacksmith shops, store, barn and two dwelling houses. There is also a machine shop with a complete equipment of tools.

Block riffles and undercurrent with quicksilver are used. The mine has not been working for one year. Thomas M. Logan is president; H. DeC. Richards, vice president and general manager; D. F. Hamon, secretary, and Dred T. Hale, superintendent.

*Pearch Mine* (hydraulic). Consists of two claims, patented, owned by P. L. Young and others of Orleans, and located in Sec. 32, T. 11 N., R. 6 E., about 1 mile northeast of the town of Orleans on the southeast bank of the Klamath River at an elevation of 537 feet. These claims were located about forty years ago by a man by the name of Pearch, and the names of the claims are John A. and Eli Pearch. They are on the Klamath Forest Reserve. There is a good road to the mine from Orleans. The course of the gravel channel is northeast and southwest and the gravel is a heavy wash with a little cement gravel. There are  $1\frac{1}{2}$  miles of ditch and flume which brings 1000 inches of water from Pearch Creek under a head of 170 feet. There are two reservoirs, 1000 feet of 22, 18, and 15-inch pipe, one No. 3 and one No. 4 giant. Eight hundred feet of sluice with block riffles and quicksilver are used to save the gold. There are two dwelling houses, a barn, wagon-house and other small buildings on the property. This mine is in operation every winter.

*Red Porphyry Mine* (hydraulic). Consists of four and one half claims or 90 acres of unpatented mineral land owned by O. T. Crowe, B. F. Hiatt and others, and located in the Willow Creek mining district in Sec. 17, T. 7 N., R. 5 E., about 2 miles north of the village of Willow Creek on the west bank of the Trinity River. Claims located in 1899. A good road from Eureka crosses the mine. The elevation above sea level is 600 feet. The mine is on the Trinity Forest Reserve. There are two gravel channels having a north and south course, one bench being 900 feet long and the other about 1200 feet long. The bedrock is a black slate. Water is brought from Kirkham Creek in one mile of ditch and 500 feet of flume; 500 inches of water, under 250-foot head, is used; 470 feet of 11-inch pipe and one No. 2 giant are used; 240 feet of sluice and 32 feet of undercurrent, block riffles and quicksilver are used. There are two buildings and a blacksmith shop on the property. The mine was not worked very extensively up to 1907, but since then it has been worked every winter. The gold is fine, assays \$18 to \$18.25 per ounce and has platinum associated with it.

*Rocky Point Mine* (hydraulic). Consists of three claims of 60 acres located twenty years ago and unpatented. Owned by William Wittmore and located in the Orleans mining district in Sec. 21, T. 11 N., R. 6 E., at an elevation of 500 feet. There is a wagon road to within 2 miles of the property, which lies 3 miles northeast of Orleans on the southeast bank of the Klamath River. They are in the Klamath Forest Reserve. Water is brought from Wittmore Creek by one mile of ditch and 300 inches of water at 150-foot pressure is delivered to one No. 2 giant by 600 feet of 9-inch pipe. The bedrock is slate and serpentine and the bench gravel has a northeast and southwest course. There are 200 feet of sluice, and block riffles and quicksilver are used for catching the gold. There is one house on the property. The mine works during the winter months only.

*Rosalina Placer Mine* (hydraulic). Consists of two unpatented claims owned by Lew Nelson and located in T. 11 N., R. 6 E., on the northwest bank of the Klamath River about eight miles from Orleans by trail at an altitude of 550 feet. These claims were located about twenty years ago and are in the Klamath Forest Reserve. There are two benches of gravel, both having a northeast and southwest course, and the bedrock is slate. There is  $\frac{1}{4}$  of a mile of flume, one large reservoir and 800 inches of water are brought to the mine under a 400-foot pressure through 200 feet of 21-inch pipe and 300 feet of 15 and 11-inch pipe. Two No. 2 giants are used. Block riffles with under-current and quicksilver are used for saving the gold. There are one house, a blacksmith shop, derrick and a barn on the property. The gold is fine and flaky and assays \$17 per ounce. A little platinum also accompanies the black sands. The mine works only three months in the winter.

*Rough and Ready Placer Mine* (hydraulic). Consists of 40 acres of unpatented mineral placer land, and 80 acres of patented land, formerly known as the Rough and Ready Placer and the Sarvorum placer groups, the former owned by A. R. Wilder and the latter owned by A. R. Wilder, E. F. Wilder, B. H. Wilder, D. Wilder, and N. Wilder. They are located in Secs. 1, 2, 11 and 12, T. 10 N., R. 5 E., in the Orleans mining district, 3 miles southwest of Orleans on the southeast bank of the Klamath River. The Sarvorum group of 80 acres is patented, while the remaining is unpatented. The Rough and Ready group was located some time in the sixties and the Sarvorum group was located in 1894. This property is at an altitude of 500 feet. The gravel benches have a northeast and southwest course and the bedrock is slate. Water is brought to the property from Boise Creek and tributaries in  $4\frac{3}{4}$  miles of ditch and flume, 100 inches being used under 250-foot head. The gravel is medium wash with large boulders on

bedrock. There are 1000 feet of 11, 9, and 7-inch pipe, one No. 1 giant, 200 feet of sluice boxes, one barn, one small sawmill and several smaller buildings. The sawmill is run by water power generated by an undershot wheel. The gold assays \$17 to \$17.25 per ounce. Small spots of cemented gravel are found on bedrock. There is about 10 per cent loss in fine gold. The Rough and Ready group is about 300 feet above the river and the Sarvorum is about 60 feet above. The Sarvorum is used for ranching purposes now. The Rough and Ready is worked every winter.

*Salstrom Placer Mine* (hydraulic). Consists of five claims, none of which are patented. They are located in Sec. 1, T. 10 N., R. 5 E., and Sec. 36, T. 11 N., R. 5 E.,  $1\frac{1}{4}$  miles southeast of the town of Orleans, on the northwest bank of the Klamath River, at an altitude of 500 feet. They consist of gravel benches. The course of the channel is east and west. The bedrock is slate and the wash is large with large boulders on bedrock. The county road runs through the property. These claims are owned by Jonas Salstrom of Orleans. The property is in the Klamath Forest Reserve. Water is brought from Crawford Creek in  $\frac{5}{8}$  of a mile of flume; 800 inches under 185-foot pressure is delivered in 1500 feet of 24 and 15-inch pipe to one No. 2 and one No. 3 giant. These claims were located first in 1852 and relocated in 1890. One claim was located in 1910. Fourteen hundred feet of sluice boxes are used and block riffles with quicksilver are used to save the gold. There is a dwelling house, blacksmith shop, tool house, sawmill and barn on the place. The sawmill is run by water power. A small amount of platinum accompanies the gold. At the present time the mine can only work nine weeks during the winter months, on account of the scarcity of water. The gold is flaky and assays \$17 per ounce.

*Thompson Bar* (hydraulic). Consists of four unpatented claims located in the Weitchpec mining district about halfway between Weitchpec and Orleans, on the northwest bank of the Klamath River, in Sec. 20, T. 10 N., R. 5 E., at an altitude of 650 feet. They are owned by William M. Salsbury, who located them in 1907. The county road passes on the opposite side of the river. The mine consists of bench gravels on a slate, serpentine and schist bedrock. The course of the channel is northeast and southwest. The gravel is small wash with large boulders on bedrock. Water is brought from three small creeks south of Red Cap Creek in  $2\frac{1}{2}$  miles of ditch and flume under 200 feet head. Three hundred inches are used. Hungarian riffles and quicksilver are used to save the gold. During the last three years no work in the way of washing has been done on account of the ditch being carried away frequently by the side hill sliding out. Eighty-four feet of sluice boxes carry the gravel into the river. The gold is flaky

and assays \$17 per ounce. No platinum contained in the gravel. There are 300 feet of 11-inch pipe from the ditch to the No. 2 giant.

*Weitchpec Bar Mine* (hydraulic). Consists of one unpatented claim of 20 acres located in the Weitchpec mining district at the village by that name in Sec. 10, T. 9 N., R. 4 E., at an elevation of 640 feet, and owned by J. C. Gist. The county road runs through the property. The bench gravels have a northwest and southeast direction and the bedrock is an altered schist. The gravel is medium size and loose. Water is taken from Weitchpec and Ben creeks and the Klamath River, 300 inches being brought to the mine in one mile of flume and ditch and under 125 feet pressure. There are 250 feet of 15-inch pipe and 1000 feet of 11-inch pipe, three giants, Nos. 1, 2, 3. One derrick for handling boulders, 250 feet of sluice boxes. Block riffles and quicksilver used to save the gold. There are a house and a barn on the mine. The gold is flaky. The mine works every winter and generally closes down the first of June. There is some platinum in the gravels.



Briceland Estate Gas Well at Briceland, Humboldt County, California.

### NATURAL GAS.

As mentioned under oil, a gas suitable for illuminating and fuel purposes flows from some of the wells in the oil district of the county. There are many instances where gas is escaping from oil seepages, but only in two instances is the gas in sufficient quantity to be useful for domestic purposes.

*Frank Peters Gas Well.* There are three springs on Frank Peters' land in the village of Capetown in Sec. 13, T. 1 N., R. 3 W. The gas is tanked and used in the house for lighting and fuel purposes.

*Briceland Estate Gas Well.* A gas well is located on this estate at the town of Briceland in Sec. 18, T. 4 S., R. 3 E. The well is 780 feet deep and has 7½-inch casing. The well is capped and the gas is drawn off by a 1-inch pipe for lighting the houses of the town of Briceland. No storage tank is used, consequently the pressure is rather low after a few hours' use.

### GRAPHITE.

Graphite of an impure quality is found at Otto Rest on the South Fork of Trinity River on the line of the new state highway, also in T. 10 N., R. 4 E., and a little near the city of Eureka. No development has been done.

### IRON.

Vivianite (phosphate of iron) is found on Maple Creek and also at Yager. Hematite boulders in large quantities are found on the ocean beach 4 miles south of Centerville. Soft red hematite also occurs on James Creek, 2 miles northeast of Arcata. No development is being carried on with these deposits.

### MINERAL WATERS.

At the present writing no mineral water is shipped out of the county, although arrangements are being made to place the output of a new spring on the market in the near future. There are not many mineral springs in Humboldt County. Some years ago a spring was being used by the Humboldt Mineral Water Company. It was located at Flannigan's mill, 2 miles south of Eureka on the edge of the bay, and owned by the Bayside Lumber Company. The waters were bottled for local consumption until another firm began to bottle and charge the city water for local consumption.

The waters from the above mentioned spring contained the following ingredients:

Sodium chloride .....	32.91
Calcium carbonate .....	16.37
Magnesium carbonate .....	10.63
Sodium carbonate .....	2.45
Silica .....	1.32
Aluminum .....	.20
Iron oxide .....	.06
Traces of sulphates and organic matter and abundant carbonic acid.	

*Felt's Springs.* These springs are situated on the side of the mountain, 1 mile west of Strongs Creek and  $5\frac{1}{2}$  miles northeast of Fortuna, in T. 3 N., R. 1. E., H. M. There are three sulphur springs close together, and at one time hotel accommodations could be had at the springs.

Waters contain the following minerals:

Sodium chloride	Magnesium chloride
Sodium carbonate	Magnesium carbonate
Potassium chloride	Manganese
Potassium carbonate	Traces of iron
Potassium sulphate	Alumina
Calcium carbonate	Silica.

*Iagua Mineral Water.* This spring is situated on the water front of the city of Eureka on the property of the Pacific Oil and Fuel Company. At one time the mineral water bubbled from the mud flats of the bay until a bulkhead was put in and the spring piped up to the level of the wharf. A pump is now used for securing the water and the spring is visited by many of the residents of the city. The Indians are supposed to have used the water years ago and the Indian name of "Iagua," meaning "Good morning," still clings to it. An analysis made by Professor William D. Johnson in 1885, gives the following ingredients:

One U. S. gallon	Contains in grains
Sodium chloride .....	1,403.00
Sodium carbonate .....	10.10
Sodium bromide .....	14.00
Potassium sulphate .....	12.20
Magnesium chloride .....	101.00
Magnesium sulphate .....	211.30
Calcium carbonate .....	3.80
Calcium sulphate .....	42.50
Alumina .....	1.30
Silica .....	0.95
Ferrous carbonate .....	0.12
Traces of manganese, boracic acid, iodine and lithium.....	1,800.27



There is carbonic acid gas in small amounts and the water is saturated with sulphuretted hydrogen. This mineral water is being placed on the market in San Francisco by George A. Knight, who owns the spring.

*Cooks Springs.* These springs are situated on North Yager Creek, 35 miles east of Eureka. They are sulphur and iron springs but have not been exploited.

*Mountain View Spring.* This spring is situated on Mad River, 28 miles from Eureka, and is a small spring smelling strongly of sulphuretted hydrogen.

*Yager Creek Springs.* They are located on the headwaters of Yager Creek on the ridge between it and Mad River. No improvements have been made on the property.

### OIL.

Oil was known by the white man to exist in the southwestern portion of Humboldt County as early as 1860 and by the Indians even before this time. Oil was collected from seepages at times and used for supposed medicinal properties that it possessed. After the collapse of the oil boom in the eastern states in 1861 and 1862, people again began to make investments in oil. The people of California hoped to find an oil field in this State similar to that in Pennsylvania. Samples of oil were collected from the different seepages in the county, an oil boom started and many locations made. The town of Petrolia was laid out and times were good for a while. It was very difficult and expensive to transport supplies and machinery to the oil district, as roads were few and the steamers made their landing at Eureka and freight had to be shipped to the oil district by freight teams.

The principal oil field extended from the coast line at Capetown thence in a southeasterly direction to Garberville, on the south fork of Eel River, a distance of about 42 miles in length, and from the Rainbow ridge on the northeast to the Cooskie range on the southwest, a distance of 12 miles. This district may be divided into the Bear River district, which includes Bear River and its tributaries; the second or Lower Mattole River and lower north fork of Mattole River, and the third or the Upper Mattole River and upper north fork of Mattole River. The fourth district embraces the territory in the vicinity of Briceland and Garberville.

In the vicinity of Briceland the general strike of the formation is northwest and southeast. In some places the formational series of metamorphic gray sandstones and shales contain no fossils but are thought to be of Cretaceous age. In other places a series of sandstones and shales containing fossils of Neocene age are noted lying non-

conformably on the sandstone and shale of Cretaceous age. The Cretaceous rocks are lying at a fairly steep dip and, in places, carry petroleum and gas. There are numerous seepages of oil throughout the district, and oil can be gathered at these places in small quantities. Gas also is found escaping through the oil and water in these springs.

The oil in the Petrolia district is of a dark green color, while that of the Briceland district is more reddish in color. Both oils are of a paraffine and olefine base with a specific gravity (at 64° F.) of 0.8229, which is equal to 39.8° Baumé. It had a flash test of 73° F. and a fire test of 84° F. and has high burning qualities. The oils contain a high percentage of paraffine wax and produce a fairly good quality of lubricating oil and a high grade cylinder oil.

*Distillation percentages obtained from Humboldt County oils:* 25.1 per cent engine distillate 50° gravity Baumé at 60° F.; 35.2 per cent water white refined oil with fire test of 123° F.; 7.75 per cent white neutral oil at 35.5° gravity Baumé at 60° F.; 29.90 per cent lubricating oil of 28° gravity Baumé at 60° F.

*Union Well.* Drilling for oil in Humboldt County began in the year 1865 and, according to men familiar with oil development in the county, the first well was called the Union and was drilled in that year under the auspices of Hon. L. Stanford. This well was drilled in Sec. 30, T. 1 S., R. 1 W. (all wells referred to the Humboldt meridian), and was 500 feet deep. It is reported to have been a 10 to 15-barrel well. The oil had to be pumped. For the log see the seventh report of the State Mineralogist.

*Brown and Knowles Well.* This well is situated in Sec. 24, T. 1 S., R. 2 W., on the north fork of the Mattole River. It was drilled to a depth of 300 feet, but no oil was obtained. No gas or water flowed from the well.

*Henderson Well.* This well was situated in Sec. 15, T. 1 S., R. 2 W., and was drilled to a depth of 500 feet. It was reported as a 10-barrel well and had to be pumped.

*McNutt Gulch Well.* Situated in Sec. 30, T. 1 S., R. 1 W., and was down 300 feet. It was drilled in 1865 and gave only a few barrels.

*Burrows Well.* This well was situated in Sec. 5, T. 2 S., R. 1 W., and was drilled by the Far West Oil Company in 1892 on Buckeye Creek. At a depth of 500 feet, a flow of 5 barrels was obtained. At 800 feet, the string of tools was lost and the well was abandoned.

*Davis Creek Well.* This well is situated in Sec. 13, T. 1 S., R. 3 W., and was drilled in the year 1893 by the Far West Oil Company. Drilling was continued to 800 feet, at which depth the casing was pulled and the well abandoned. Whether oil was obtained is not known.

*Mackintosh Well.* Situated in Sec. 29, T. 1 S., R. 2 E. It was drilled in 1902 to a depth of 1700 feet, and the flow is reported to have been 15 barrels of 45° gravity oil.

*Craig Well.* This well is situated in Sec. 30, T. 1 S., R. 1 W., and was drilled in 1902 to a depth of 700 feet. Another hole was put down to a depth of 800 feet, but the results were not satisfactory.

*Wild Goose Wells.* These wells are situated in Sec. 15, T. 1 S., R. 2 W., and were drilled in 1901 and 1902, one to a depth of 700 feet and the other to 1033 feet. No oil was obtained in the 700-foot well, but in the other oil was obtained at a depth of 221 feet. Oil sands 60 feet thick were passed through, and from these the drill passed into black shale. At 300 feet the water was shut off, and at 400 feet a small quantity of oil was obtained. The next 40 feet the formation was limestone, but a thin oil sand was struck at 441 feet. At 555 feet gas was encountered in large quantities sufficient to throw the string of tools from the casing. At 775 feet an oil sand yielded a flow of 15 to 20 barrels. At 1033 the string of tools was lost and the well abandoned. Water is now flowing from the well.

*Humboldt Well.* This well is situated in Sec. 6, T. 2 S., R. 1 W., and was drilled in 1901 and 1902 to a depth of 2000 feet. The formation was black shale all the way. Only a trace of oil was found at 1200 feet, and the well was abandoned.

*Hoaglin Well.* This well is situated in Sec. 2, T. 3 S., R. 1 W., and was drilled in 1901 and 1902 by the Mattole Paraffine Company. It was drilled to a depth somewhere between 1700 and 1800 feet. Some oil at 1600 feet was obtained but the quantity could not be ascertained.

*Reed Well.* Located in Sec. 14, T. 1 S., R. 2 W., this well was drilled in 1901 and 1902 to a depth of 400 feet. Only gas was obtained. The company leased considerable land but did very little work.

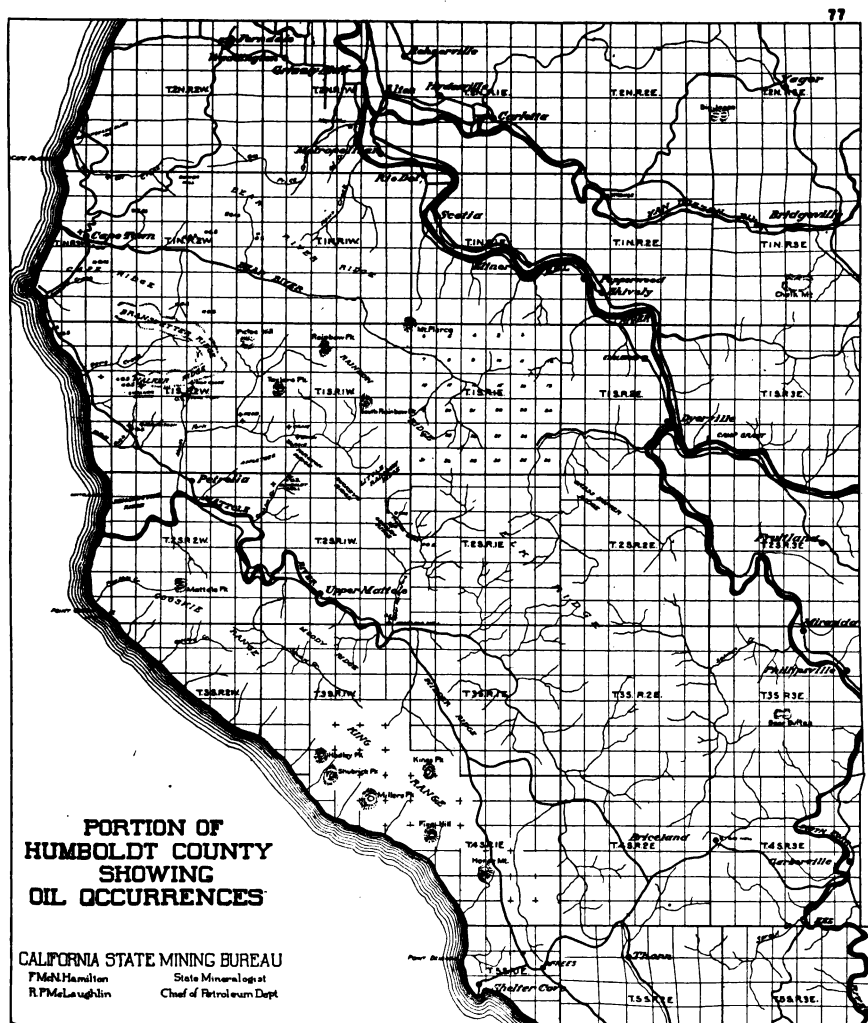
*Bear River Oil Wells.* One well was drilled in Sec. 12, T. 1 N., R. 3 W., close to the village of Capetown. Three wells were drilled in Sec. 16, T. 1 N., R. 2 W. The wells were drilled to a depth of a few hundred feet, but no oil was obtained, and the works were abandoned.

*Briceland Oil and Land Company's Well.* This well is situated 5 miles southeast of Garberville and was drilled to a depth of 2100 feet. Oil sands at 410 feet were encountered carrying a little oil and at 503 feet the drill entered granite. The remaining 1597 feet of the well were drilled in the granite formation. The well was abandoned.

There are many seepages of oil throughout the region, occurring at points of fracture in the formation, some being in the Mattole River and a number in the creek beds. The oil is light, and no doubt much of it has evaporated. Not being of an asphalt base, the dark stain is

not so apparent in the discoloration of the sandstone formation at these points of seepage. On breaking the sandstone, the odor of petroleum is very noticeable. Considering the broken condition of the sandstone and shale formations, the amount of oil seeping from the fractures is very small compared with other oil fields. The oil sands are rather thin so far as proven. This is also true of the oil-bearing shales of the district.

The wells drilled heretofore have not been located with any geological skill. Most of them have been drilled in close proximity to a fracture in the formation where oil was exuding. In other instances money



has been wasted in the drilling operations. The instance of a well being drilled in granite will serve to illustrate this point.

The dip of the formation is mostly to the northeast, but at Briceland there is a section of sandstone having a dip to the southwest. A company is now said to be organizing under the direction of Briceland people to drill in this formation. Aside from this, there is at present no activity in the oil district of the county. Many reasons for the failure to continue drilling in this field have been advanced, among them being the withdrawal of the land from sale and holding it as mineral land subject to entry as such. Taken together with expensive transportation and competition with cheap oil from Pennsylvania, these two causes are said to have been the reasons for quitting in 1867. However true this may be, it remains to be proven that there are wells in the district that are capable of producing oil in sufficient quantities to pay to work them commercially, even under favorable conditions. So far, only small producing wells have been found.

Bibl.: Report VII, pp. 195-200; VIII, p. 216; X, 207; XI, pp. 227-232; Bull. 19, pp. 161-166; Bull. 69, pp. 444-454.

#### OCHRE.

There are deposits of red ochre of good quality near Garberville and also 8 miles from Ferndale. No development has been done.

## MENDOCINO COUNTY.

Field Work in October, 1913.

## BRICK AND TILE.

Brick and tile were manufactured at one time near the coast at the town of Mendocino and also at the county seat, Ukiah. Good clay deposits are available at these places but the demand for the product was not sufficient to make the business a profitable one, consequently the yards closed down. All brick and tile are now imported into the county from San Rafael by way of the California Northwestern Pacific Railroad.

## COAL.

Lignite is found at several localities in the county, where it usually occurs in thin seams from a few inches to a foot in thickness. Three parallel beds of lignite traverse the county in a direction parallel to the coast line.

The most western bed lies 12 to 25 miles inland from the coast. There are croppings of this bed at Dooling's Canyon, Ackerman Creek near Ukiah, in Walker Valley 4 miles south of Willits, at the head of Ten Mile River, on Mill Creek and also in Humboldt County. This bed consists of small seams of coal of good quality but does not occur in payable quantities. Some of the coal will coke and some has been used in blacksmiths' forges with success.

The third bed lies 15 to 20 miles still farther inland and contains a vein of considerable thickness. The *principal* outcrop occurs on the middle fork of the Eel River near the mouth of Salt Creek and about 4 miles from the railroad at the forks of South Fork and Middle Fork of Eel River. This bed of coal has been traced for a distance of 10 miles,  $7\frac{1}{2}$  miles being on patented land owned by James Flood and  $2\frac{1}{2}$  miles on patented land owned by W. P. Thomas and associates, of Ukiah. Four or 5 miles of the croppings have been proved up, and, as far as developed, the vein appears to average about 16 feet in thickness. The bed begins in Sec. 9, T. 22 N., R. 13 W., and takes a southeast direction for 10 miles to Sec. 36, T. 21 N., R. 13 W., cutting across the middle fork of Eel River. The croppings on the river opposite Salt Creek have been developed to some extent and found to dip  $31^\circ$  northeast. The thickness at this point is 14 feet, with a seam of whitish slate 3 to 6

inches thick near the middle. The section of the formation here shows the following strata :

Top stratum not exposed.	
Blue clay shale weathering to small fragments	26 feet
Coal of good quality and luster	5 feet 6 inches
Soft white slate containing sulphate and carbonate of lime	3 inches
Coal of dull luster	8 feet
Sticky blue clay containing minute shells	21 feet
Some clay containing oyster shells	1 foot
Soft gray agglomerate containing clay, fragments of serpentine and sandstone	5 feet 6 inches
Soft greenish metamorphic sandstone	30 feet
Serpentine beneath.	

In a cliff, about 80 feet high which is about 1000 feet up the river, a hard greenish metamorphic rock is exposed, the strata of which seem to lie conformably upon the coal. About  $\frac{1}{2}$  mile north from the cropings and about 300 feet above the river several openings in the hill have been made and a tunnel said to be 400 feet long has been run on the vein in a direction of N.  $10^{\circ}$  E. About 50 feet of this tunnel is still open but the rest has caved. Sixty feet above the mouth of this tunnel, an incline shaft has been sunk on the dip of the vein to a depth of 30 feet. This shaft is in coal all the way, being 7 feet high, with coal exposed in both the roof and floor.

Below the coal bed and to the west of the workings a hard metamorphic sandstone is exposed but its position and thickness could not be judged. A few hundred feet east of these openings, metamorphic rock again occurs and rises in the form of a cliff 400' to 500' high, forming a sentinel rock for the surrounding country. It is to be noted that the coal occurs in a seam between the beds of highly metamorphosed rock without itself having undergone any great change in structure or composition.

Coal also outcrops about 1 mile southeast of the mouth of Salt Creek. The underlying stratum here is a white colored rock composed of a mass of broken shells and the strike is south  $35^{\circ}$  east. Still another mile up the creek, there is another outcrop on which some prospect holes have been sunk to prove up the seam. The coal has been traced northwesterly from the river and the same vein is supposed to extend into Round Valley. The coal along the Eel River appears to be of the Cretaceous age, while the coal of Round Valley appears to belong to the Tertiary period. The Round Valley coal is a bright, glistening variety with conchoidal fracture. It contains little ash and a high percentage of carbons and stands transportation well.

The coal along this belt is no doubt a valuable asset to the county and, now that transportation is within a reasonable distance, it remains to be seen if it can be mined and put on the market at a sufficiently low cost to compete with the present coals and petroleum.

LOUIS FALKENAU, State Assay Office, Safe Deposit Building, Room 16, southeast corner California and Montgomery streets.

No. 14,357.

San Francisco, August 2, 1890.

J. L. FLOOD, Esq.,

Dear Sir: I have made a careful technical analysis of a sample of coal received from you marked "Eel River Coal Mine, Mendocino County," and a sample marked "Wellington," with the following results:

	Eel River	Wellington
Specific gravity .....	1.302	1.300
Moisture .....	7.9 per cent	2.4 per cent
Volatile combustible .....	33.2 per cent	33.45 per cent
Fixed carbon .....	58.5 per cent	58.6 per cent
Sulphur .....	0.4 per cent	0.15 per cent
Ashes .....	2 per cent	5.4 per cent

The cokes furnished by the two coals (sample of which I hand you with this report) are the same in appearance, but that of the Eel River coal contains 3.6 per cent of ashes, while that of the Wellington contains 8.4 per cent.

The Eel River coal weighs 81 pounds per cubic foot and in place 24.7 cubic feet will weigh a ton of 2000 pounds, but to store a ton, about 42 cubic feet will be required.

As the sample of Eel River coal is, according to your statement, from the surface exposed to extraneous moisture it is to be assumed that the coal at greater depth will contain much less moisture. If the Eel River and Wellington are both figured to dry coal, their carbon compares as follows:

	Eel River	Wellington
Volatile combustion .....	39.73 per cent	34.42 per cent
Fixed carbon .....	58.19 per cent	60.04 per cent
Total carbon .....	97.92 per cent	94.46 per cent

From the foregoing I consider sample of Eel River coal as equal to the Wellington for domestic use and as fuel for steam boilers.

Yours respectfully,

(Signed) LOUIS FALKENAU.  
August 11, 1890.

#### Analysis of Two Samples of Coal for Geo. R. Wells, Esq.

	"A"	"B"
Water .....	6.70 per cent	2.55 per cent
Volatile carbonaceous matter .....	52.89 per cent	62.01 per cent
Fixed carbon .....	38.66 per cent	29.64 per cent
Ash .....	1.75 per cent	5.80 per cent
	100.00 per cent	100.00 per cent
Sulphur .....	2.49 per cent	1.81 per cent

The sulphur is present in the form of sulphates of lime.

By the combustion of two samples of coal of 1 pound each, the following quantities of water were evaporated:

Sample 1.—13.86 pounds. Sample 2.—12.8 pounds.

Both samples form a good soft coke.

THOMAS PRICE & SON.



## STATE ASSAYER'S OFFICE.

SAN FRANCISCO, December 8, 1870.

Analysis of coal from vein running through Eel River to Round Valley:

S. W. Glazier, Esq. (for the company),

DEAR SIR: I have made a careful analysis of a specimen of coal received from you and have arrived at the following results:

Specific gravity .....	1.282
Volatile combustible substance .....	40.20 per cent
Fixed carbon .....	49.70 per cent
Moisture .....	6.70 per cent
Ashes .....	3.00 per cent
Sulphur .....	0.40 per cent

Amount of gas evolved, 37 cubic feet for 10 pounds Avd. of the coal.

The coal burns freely, yields a fire light and compact and sonorous coke, and its ashes are of a reddish-gray color and do not slag.

The amount of sulphur is so minute that it does not make itself perceptible to the smell in burning the coal.

Respectfully yours,

L. FALKENAU, State Assayer.

## COPPER.

Copper mining is dormant. There are several prospects where slight development has been done, but these workings have caved in and are practically abandoned. Among the prospects that have received some attention may be mentioned the following:

*Eden Valley Copper Mine.* This mine is sometimes called the Deep Hole copper mine and is situated in Sec. 13, T. 20 N., R. 12 W., M. D. M., in the Eden Valley mining district at an elevation of 2500 feet. It is owned by W. P. Thomas and associates of Ukiah. There are two claims, comprising 40 acres, located in 1900.

Three or four small veins from four inches to a foot in thickness strike northwest—southeast and dip 22° northeast. The veins are composed of quartz carrying chalcopyrite in one vein and carbonates in another. The ore averages about 10 per cent copper. The hanging-wall is a soft slate and the footwall is a quartzite. Two hundred feet of the vein has been proven on the surface. There is a 40-foot shaft which cuts three veins. No work has been done for the last seven years. A cabin, bunkhouse, blacksmith shop, and barn are on the property.

*Native Copper Mine.* This is a prospect situated in Lost Valley, and at one time owned by C. H. Staut of Ukiah. The only work that has been done consists of trenching. It has been idle for some years. The native copper is disseminated throughout serpentine which is also the country rock in this vicinity.

*Salinas Copper Mine.* This prospect is also in serpentine formation in Lost Valley and the strike is northwest—southeast, and the dip 65° NE. Some sulphide ore was taken out. It was owned at one time by C. H. Staut, but has not been worked for some years.

*Red Buck Mine.* This property is an extension of the Salinas mine and the development work consists of a 35-foot tunnel and a 50-foot winze from it, all of which has caved and been abandoned.

*Red Mountain Group.* This group consists of four claims situated 10 miles southeast of Ukiah on the ridge which divides the waters of the Russian River and those of Clear Lake and Cache Creek. There are two veins, located in 1890 and relocated from time to time. The formation is serpentine. One claim is developed by an open cut and a crosscut tunnel. Several small bunches of ore have been found in the cut showing green carbonates and metallic copper. An adjoining claim is developed by two shafts, one 100 feet and the other 50 feet deep. In 1896, carbonate ore was taken out above the 50-foot level in one shaft, and the shaft was extended to the 100-foot point, but no ore was exposed, the bottom being in sandstone and clay. From an incline several tons of low grade ore have been taken out. The former owners were Huff & Gibson of Ukiah. No work has been done for some years.

*Ogle Copper Mine.* This mine is situated in Anderson Valley mining district in T. 13 N., R. 12 W., and consists of 2000 acres of patented land. It joins the Redwood Copper Queen mine on the north. A 16-foot shaft in the center of the claim exposed carbonate ore. Not enough work has been done to demonstrate the width of the vein. Gossan can be traced through this property for a distance of a mile. Ogle Brothers of Orinda were the former owners.

*McGimpsey Mine.* Situated in Secs. 13, 17 and 18, T. 13 N., R. 12 W. The property comprises eight claims in a serpentine formation. Considerable copper stain is shown in the open cuts and, in a few places, red oxide of copper mixed with oxide of iron is seen. The former owner was C. P. McGimpsey of Ukiah.

*Pieta Mine.* This prospect consists of only one claim and is located 10 miles northeast of Cloverdale and 4 miles north of the southern boundary of Mendocino County. There is a 55-foot open cut across the vein material which strikes east and west. It has not been worked for years. The ore carries a slight trace of carbonate of copper and the gangue material is mostly iron oxides. The walls are serpentine. The former owners were J. C. Caldwell and associates of Healdsburg, Sonoma County.

*Redwood Copper Queen Mine.* This property, consisting of 840 acres of patented land, located in Secs. 17 and 20, T. 12 N., R. 13 W., M. D. M. It is 25 miles by wagon road from Cloverdale, which is the nearest railroad station. The country rock is a highly altered sandstone covered with a thick layer of soil. There is a heavy growth

of timber on the land. Gossan croppings appear at several places. Development work has shown a mineralized zone 300 feet long, 10 to 40 feet wide and 125 feet deep, carrying kidneys and lenses of sulphide ore the size of a man's fist and larger. The largest kidney found was 75 feet long and six feet thick. The ore is a heavy iron sulphide carrying copper up to 8% or 9% and small values in gold and silver.

During the year 1906, 400 tons of ore were shipped to the Peyton Chemical Company plant for treatment. Its high sulphur content and the absence of arsenic made it desirable for the manufacture of sulphuric acid. The company is a San Francisco corporation of which E. R. Leach is president, and Claude Mellersh, secretary.

### CHROME IRON.

There is a deposit of chrome iron in Sec. 24, T. 15 N., R. 13 W., M. D. M., about one and one half miles west of Ukiah. Very little work has been done to develop this deposit.

Chrome iron has also been found 12 miles north of Willits.

### GOLD.

There is no mining for gold in Mendocino County at the present time. In former years there was some development work being done on the Boy Edgar and Van Allen mines but only the ever-present legends remain telling of good values and lost mines.

*Boy Edgar Mine.* This mine was worked some years ago by the owner, C. H. Staut of Ukiah, and is reported to have been rich in free gold. The ledge was lost and hunted for by prospectors but has never been found. It was supposed to be located somewhere on the trail from Ukiah to Lost Valley. C. H. Staut, the former owner, died several years ago.

*Van Allen Mine.* This property is situated 6 miles west of Ukiah at an altitude of one thousand feet. There are two claims named "Carrie" and "Fred." The strike of the formation is northwest and southeast and the dip 20° NE. There are five prospect tunnels. The one in which the last work was done is a crosscut tunnel 170 feet long. This tunnel has cut several stringers of quartz in a hard, tough blue glaucophane schist. Only assessment work is being done. Property is owned by William Van Allen of Ukiah.

There were several other prospects mentioned in the Thirteenth Report of the State Mineralogist. These, however, were merely locations and the assessment work lapsed soon after the locations were made, so they are not mentioned here.

**MANGANESE.**

There is a manganese deposit of considerable magnitude located in Secs. 22, 27, 34 and 35, T. 17 N., R. 12 W., M. D. M. Eight claims were located by W. P. Thomas, Requa, Taylor, and others in 1912. The vein is in quartzose schist and the strike is northwest and southeast and the dip  $75^{\circ}$  to  $80^{\circ}$  NE. The width varies from 3 feet to 20 feet. In 1912, one thousand dollars was expended in developing the claims and some work has been done every year on the property. Four hundred to 500 feet of the vein has been stripped and crosscut trenches have been cut for several hundred feet more.

The claims are 3 miles from the railroad and a wagon road passes within a mile and a half of it. The ore is of a high quality as will be seen from the accompanying analyses and no doubt will prove a valuable asset to the county at some future time.

*Cleveland Property.* It is situated 3 or 4 miles from the Thomas property in T. 17 N., R. 12 W., and on the same lode. The ore is a pyrolusite. No work is being done on the claims.

**Manganese Assays From Property of W. P. Thomas.**

Assay by John Crawford, chemist, for Noble Electric Steel Company, April 4, 1912:

Metallic manganese .....	52.24%
Dioxide .....	82.50%

Assay by Abbott A. Hanks, San Francisco, February 21, 1912:

Metallic manganese .....	54.07%
Dioxide .....	85.56%

Assay by Abbott A. Hanks, December 22, 1911:

Metallic manganese .....	56.23%
Dioxide .....	88.98%

Assay by Abbott A. Hanks, August 6, 1912:

Metallic manganese .....	56.67%
Dioxide .....	89.70%

Assay made by Geo. A. James Company, June 22, 1912:

Metallic manganese .....	52.1%
Dioxide .....	82.4%
Dioxide (with water removed) .....	91.2%

Assay by Geo. A. James Company, 28 Belden place, San Francisco, June 24, 1912:

Metallic manganese .....	54.9%
Dioxide .....	86.8%
Dioxide (with water removed) .....	92. %

### MAGNESITE.

There are croppings of magnesite in Mendocino County, but they have not been developed. They occur in serpentine formation like most of the other magnesite deposits of California.

*Vassar Magnesite Claims.* These claims are located 12 miles north of Cloverdale in the southeastern part of the county and within 1½ miles of the California Northwestern Railroad. These croppings are in serpentine and are owned by James Vassar, who owns 1000 acres of ranch land on which the croppings occur. No development has been done. There is another cropping of magnesite in Mendocino County near the northern boundary of Sonoma County.

### MINERAL SPRINGS.

There are several mineral springs in Mendocino County, having waters of medicinal properties, as well as some that are palatable as table waters. Some of the springs have well appointed accommodations for guests with excellent transportation equipment for visitors making use of them during the summer months. Some of these waters compare favorably with the famous waters of European resorts, as will be seen from the comparison of their analyses. The climatic conditions are unsurpassed and the scenery equally as beautiful as at other springs of the world.

*Vichy Springs.* These famous springs are located 3 miles easterly from Ukiah, in Sec. 15, T. 15 N., R. 12 W., and are reached by railroad from San Francisco to Ukiah, and thence by stage to the springs.

The waters belong to the alkalo-carbonated class, are clear and sparkling and of an agreeable pungent taste. Their chemical composition and action on the human body are almost identical with the noted Ems on the Lahn, and Fachingen of Nassau, Germany, also Vichy of Grand Grille, France.

It will be observed from a chemical analysis made of these waters that they are heavily charged with carbonic acid gas and carbonates, and that they contain some iron and potassium salts.

## Analytical Comparison of Vichy Springs.

Solid ingredients in one gallon of 231 inches in grains	California Vichy analyzed by Dr. Anderson. Temperature 93 degrees F.	Grande Grille, France, Vichy, analyzed by Broquet. Temperature 105.8 degrees F.	Fachingen, Nassau, Germany, Analyzed by Frisenius. Temperature not given	Ems on the Lahn, Germany, Analyzed by Fresenius. Temperature 115 degrees F.
Sodium chloride	28.60	32.80	36.48	62.16
Sodium carbonate	195.52	208.00	155.84	84.24
Sodium sulphate	.36	18.32	1.12	trace
Sodium phosphate		6.24	.41	
Potassium chloride	.09			
Potassium carbonate	trace	16.32		
Potassium sulphate	trace			3.08
Magnesium carbonate	19.75	11.04	10.86	6.80
Calcium carbonate	18.14	18.48	16.09	10.00
Ferrous carbonate	.07	.16	.64	.16
Strontium carbonate		.06	trace	trace
Barium carbonate				trace
Lithium carbonate			trace	
Borates	trace			
Arsenates		.08		
Aluminates	trace		trace	trace
Silica	5.92	.40	2.09	2.88
Totals	268.45	311.92	223.52	189.27
Cubic inches of gases:				
Carbonic acid gas	224.75	14.74	263.76	54.24

*California Seltzer Springs.* These springs are located in the coast range of mountains in southern Mendocino County, twelve miles north of Cloverdale, Sonoma County. There is a hotel on the property. The waters are carbonated and sparkling, and are quite palatable. An analysis by Winslow Anderson, M.D., gives the following:

	Grains per U. S. gallon
Sodium chloride	17.15
Sodium bicarbonate	53.00
Magnesium carbonate	44.60
Calcium carbonate	72.40
Ferrous carbonate	trace
Silica	trace
Organic matter	trace
Total solids	187.15

Temperature, 57°.

Free carbonic acid gas, 18.00 cubic inches.

*Orr's Mineral Springs.* These springs are situated 15 miles north-west of Ukiah, on the headwaters of Big River, in Sec. 24, T. 16 N., R. 14 W., at an altitude of 1000 feet. They are reached by rail from San Francisco to Ukiah, thence by stage to the springs. The hot sulphur baths are well known. Springs for drinking and bathing purposes occur, varying in temperature from cold to 107° F.

## Reported Analysis of Orr's Mineral Water.

	Grains per U. S. gallon
Silica .....	1.917
Silicate of soda .....	15.502
Oxide of lime .....	.425
Carbonate of lime .....	.367
Sodium carbonate .....	.175
Sodium chloride .....	1.909

There are three springs called the "Cold Sulphur," "Hot Sulphur," and "Iron Spring." The "Hot Sulphur" water has a temperature of 106° F.

*Duncan Springs.* The springs are located  $1\frac{1}{2}$  miles southwest from Hopland Station, in Sec. 25, T. 13 N., R. 12 W. Hopland is on the California and Northwestern Railroad and stages connect with trains. There are five cold springs on the property, two of which are soda, and one a sulphur spring. The other two are called the "Borax" and "Duncan" springs, the latter being the principal one. The water from this spring is claimed to be similar to the celebrated Bartlett Springs.

## Reported Analysis of Duncan Springs.

	Grains per gallon
Bicarbonate of magnesia .....	90.11
Chloride of magnesia .....	1.41
Sulphate of magnesia .....	1.64
Bicarbonate of lime .....	15.64
Silica .....	6.94
Bicarbonate of potash .....	2.37
Bicarbonate of soda .....	2.37
Free carbonic acid .....	36.57
Total .....	157.05

*Garby's Springs.* These small alkali springs are situated at the base of the foothills, one mile west of Ukiah.

*Lane's Springs.* These are located in Redwood Valley near Calpella. The waters have an alkaline but pleasant taste.

## OIL.

Some drilling for oil was conducted in the county during the oil excitement in the years 1865, 1866, 1867, but no oil in paying quantities was obtained. The oil was of excellent quality. Experiments were made with the bituminous sandstones to see if oil could be distilled from them in payable quantities. The experiments yielded a fair percentage of oil but the cost of production and freight to the consumer was too high to be a profitable venture.

These bituminous sandstones have been developed, mostly in the neighborhood of Point Arena. The beds in that region are 20 feet thick and yield from 10% to 11% volatile matter. Picked specimens run as high as 15% in volatile matter, but the bituminous sandstones as a whole are not sufficiently impregnated with petroleum to compete with other deposits of the State.

### QUARRIES.

There are no quarries operating in the county at the present time. The best quality of road metal being used in Mendocino comes from Petaluma, Sonoma County. The metamorphic rocks of the county are not suitable for road building.





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